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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Boring and Turning-mill with Turret Head.

On this page we give a front, and on page 2 a rear view of a new turning and boring-mill, with turret head, adapted for cutting threads, built by the Bridgeport Machine Tool Company, Bridgeport, Conn.

In its main features the machine is similar to the other boring and turning-mills made by the same company which have been illustrated by us, the table being driven by means of a bevel gear fastened to it near the outer edge, into which works a bevel pinion which is on the end of a horizontal shaft, this shaft being mounted in what is practically the head-stock of an engine lathe, such as are built in the same shop. There are five steps on the cone pulley, which, with the back gears and a change of speed in the countershaft, which is provided for, give twenty changes for the table, with ample driving power. The bevel gear and pinion are accurately planed to correct form and pitch.

Instead of the ordinary tool bar, such as is usually employed on such machines, the saddle is fitted with a slide carrying a revolving turret, which is fitted to receive four tools. These tools may be of any form to suit the nature of the work to be done, such as drills, reamers, taps, turning or boring tools.

Gears are used exclusively for feeding, and change gears are provided, which are put on at the end of the cross rail, and provide for cutting threads from 4 to 12 per inch.

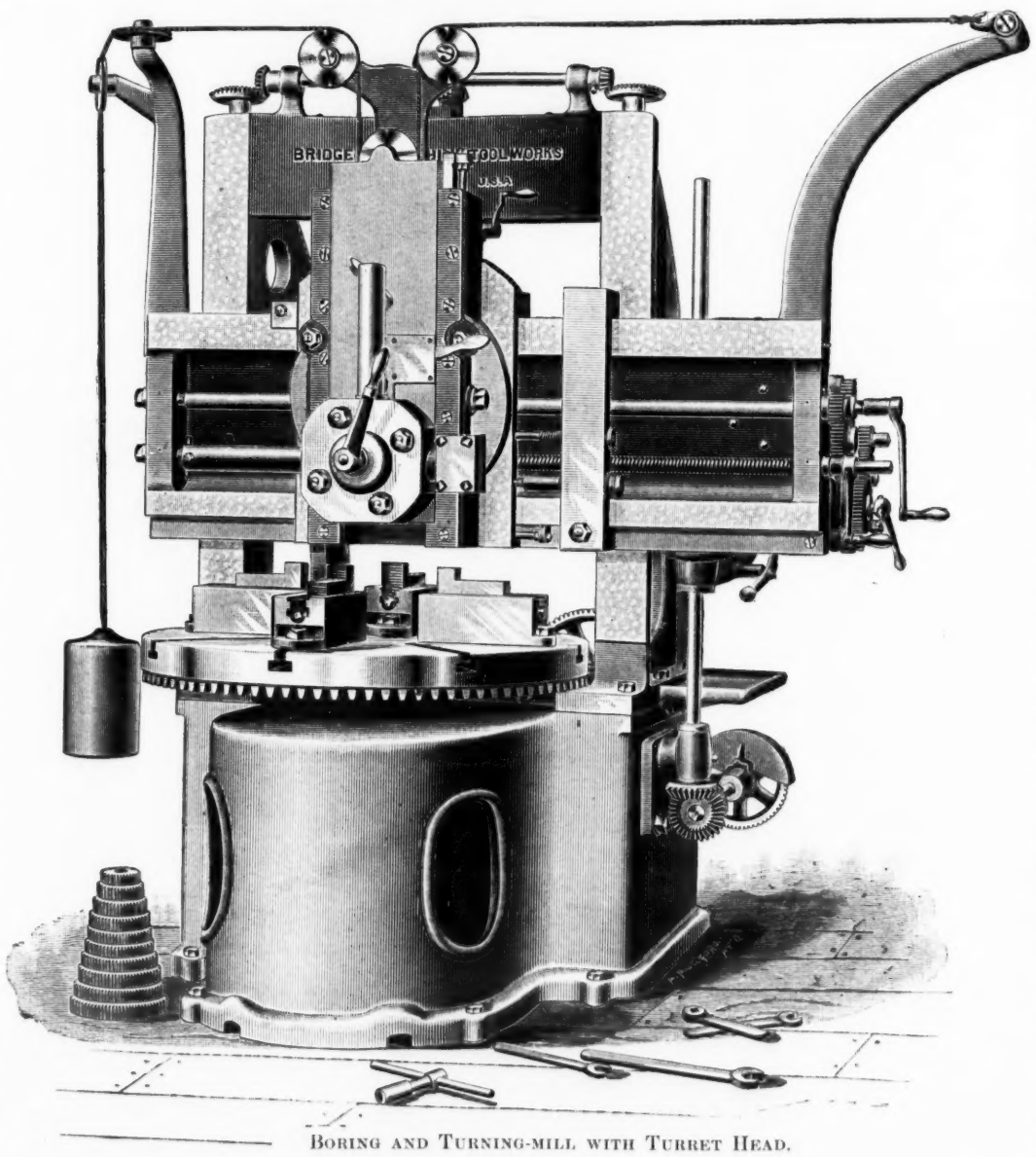
On the vertical shaft, which stands beside the right-hand housing, and by which motion is transmitted to the feed motion, there is a double-ended clutch, by which the motion of the turret slide is reversed. This clutch can be engaged again, after it has been disengaged, only when it has made an integral number of revolutions, and thus the thread is always correctly "caught" by the tool in starting in again. The lever for throwing this clutch is conveniently placed for the operator, and gives him complete control of the movements of the tool, and the work turns continuously in the same direction.

There is a stop for the saddle, which is clamped to the rail, as shown, and is provided with stop screws for regulating the depth of cut in thread chasing, the same as on the lathe, and for bringing the saddle back to its former position after it has been moved for any purpose.

Ordinary feeds for turning, boring or facing are provided for by the same train of gearing, and range from $\frac{1}{24}''$ to $\frac{1}{4}''$ in either direction, or at any angle. Graduations are provided on the head for setting to an angle, and the head is swiveled by means of a worm, which engages with teeth cut in an extension of the saddle. The turret slide is balanced in all positions, and there is a clamp for holding it when a facing cut is being taken. The feed motion of this slide has an automatic trip which can be set to operate at any desired point. The turret is unlocked and revolved by hand.

At the works of the De La Vergne Refrigerating Machine Company, in this city, the writer recently saw one of the machines in operation, it being used at that time for finishing heads for a tank used in connection with the machine, which is subjected to very high pressures, and is made with a body of steel or wrought-iron pipe, with heads of cast-steel. These heads range up to about 20″ diameter, and are bored and threaded to fit the pipe. The machine was doing the work in a very satisfactory manner, the foreman of the department in which it was used declaring that for that work no lathe could possibly compete with it.

The machines are built in two sizes, for doing work 38″ and 42″ diameter, 27″ in height, and with a turret slide movement of 16″.



BORING AND TURNING-MILL WITH TURRET HEAD.

Judge White, of Allegheny County, Pa., has decided that there is no necessity for keeping the pumps at oil wells in operation on Sunday, so he fined two parties who were brought before him for infraction of the law of the commonwealth of Pennsylvania.

Modern Development of the Steam Engine.

BY HARRIS TABOR.

FOURTH PAPER.

The pocket-book has been a potent factor in the development of the steam engine. When electric lighting began to take a commercial basis, the demand was for quick-turning engines with fair economy. As the electric light plants multiplied throughout the country, and increased in size, speed became a lesser qualification and economy a greater one in steam engines, particularly in large plants. Managers of electric light companies undoubtedly prefer the higher rotative speed, if the same economy may be obtained, but, unfortunately, 300 turns per minute means a short stroke, and a short stroke calls for maximum clearance, or waste room in the cylinder. The type of valve gear in use on the fast-running engines, on account of the variable compression, also calls for large clearance.

The makers of high-speed engines realize these objections, and nearly all have commenced another innovation in design that bids fair to become as popular as the engine that is being displaced was a few years ago. I refer now to the modern compound, and triple and quadruple expansion. The short stroke and variable compression cannot be retained with a reduced clearance, but the steam may be further expanded in doing work, thus reducing its pressure before it is exhausted into the atmosphere. The economical limit to the expansion of steam in one cylinder is soon reached, on account of excessive condensation, due to changes of temperature. This at once shows the unfitness of the simple engine for the higher pressures for which present engineering calls. It is also an indication that confirms the judgment of the engine builders who are advocating the compound type.

It is not the compounding alone that produces economy. It is rather the fact that, by compounding, a much higher pressure may be used. The Woolf compound failed because the steam pressures of his day did not come near the limit of expansion in one cylinder. No possible amount of persistence or experiment could have made a success of the Woolf engine under the existing conditions. If there had been a disposition to use higher pressure, the boilers of the time were unfit.

The conditions which make the compound engine so acceptable are the growth of years. A gradual tendency toward large power in a small space, coupled with a belief that higher pressure gives better results measured from the standpoint of the coal heap, have compelled boiler makers to give stronger boilers and better workmanship. If one will go back ten years and follow the boiler trade, he will find that each year boilers have been made stronger, until now the engine man may, with safety, expand from one hundred and seventy-five pounds to atmosphere, or even lower, if he will put enough cylinders in his train. And he may be sure that, if he will do this in an intelligent way, he will get results that would have surprised him a few years ago.

The most promising sign in the engine business to-day is the fact that the high-speed men realize that the Corliss releasing gear, with its small clearance, is much more economical than the short stroke, with from ten to fifteen per cent. of clearance. I say this is the most promising sign, because such admission on the part of a builder is evidence that we shall get some thing better from him. The fact that all makers of high-speed engines are so generally going into the compound system is an assurance that they have commenced the reform.

The most sanguine lover of the short-stroke engine will not claim for them the duty of the releasing valve gear, with its small clearance, but he will insist, and with reason, that by compounding he can make as good a showing as can be obtained from the long-stroke competitor with one cylinder. He can furnish such an engine for much less money and decidedly less cost for real estate.

There is no doubt about the future of the high-speed engine which carries expansion through two or more cylinders. Thus far its progress has been even greater than that of its prototype ten years ago. We doubt if there is now a builder of high-speed engines in the country who is not ready to contract for compound engines. In fact, we doubt if there is a builder, of prominence, of such engines, who has not a full line of patterns for multiple cylinder expansion engines. The records of the quick-running compound engines doing duty fully warrant the faith their makers have in the new departure.

We wonder if the average man has any conception of the gain that has been made in reducing the coal consumption of steam engines within the last ten years? A comparatively young man can remember the time when a guarantee of a horse-power on three pounds of coal per hour, with a non-condensing engine, was thought marvelous, and two and a half pounds condensing would have made glad the heart of the mill owner. To-day there are builders of multi-cylinder expansion engines who will guarantee a horse-power on fourteen pounds of water, if all the conditions of the plant are left to them. Of course these exceptionally high duties come from the Corliss, or some type of the releasing valve gear engines of large size. These large gains have come, primarily, from the higher steam pressure which allows great expansion, and generally from a careful study of all the conditions needed, not the least of which is more perfect workmanship. Tight pistons and valves have had their influence, as well as a tendency to reduce the waste room in the cylinder. Higher steam has compelled more perfect workmanship and design. It is only about one hundred years since James Watt congratulated himself on having obtained a cylinder for his engine that lacked only three-eighths of an inch of being cylindrical. The fact that steam pressure, scarcely above the atmosphere, was used in such cylinders, must account for their success. Imagine a piston, fitted in such a cylinder, with one hundred and fifty pounds of steam pressure back of it.

Tests of two engines have recently been made public that possess more than ordinary interest. The tests in question are from widely different types of engines. I refer to the description of the French torpedo boat, engines and boilers, and comments of London *Engineering* on the test, republished in the current number of the Journal of the American Society of Naval Engineers, and the test of the Reynolds-Corliss triple-expansion running in an electric light station in Providence. The latter test was the subject of a paper read before the American Society of Mechanical Engineers, at the Providence meeting, by J. T. Henthorn, a member.

The data is too meager, in the case of the torpedo boat, to warrant one in accepting the improbable results as correct. A speed that gave the best results was selected, with the following claimed results:

H. P. cyl	17.3″.
L. P. cyl	27.24″.
Stroke	17.3″.
Rev. per min	139.
Boiler pres. per gauge	60 lbs.
Ind. H. P	119.95.
Coal per I. H. P. per hour	1.054.

The commission estimated the theoretical value of the fuel, which was the special torpedo boat Briquettes from Anzin, at 16 pounds of steam to the pound of fuel. The boiler actually made 12 pounds per pound of coal.

The published review, from which this data is obtained, reduced the results to English standard, which made the cost of a horse-power per 1.25 pound of coal, and 15 pounds of water.

M. Normand, the builder, attributes this rare duty, in part, to the high compression obtained in both cylinders, and holds this method of reheating the cylinders in greater esteem than the steam jacket, because it operates directly against the inner surface of the cylinder instead of being transmitted through the walls.

The test of the Reynolds Corliss engine, by Mr. Henthorn, has evidently been made with unusual care, and may be accepted as standard performance of that type of engine, when all the necessary precautions are taken to produce the very highest results. As a summary of this test was published in a recent issue of the AMERICAN MACHINIST, it need not be further referred to here.

As a rule, the makers of self-contained engines test them thoroughly before they leave the works. At the Richmond meeting of the American Society of Mechanical Engineers, Mr. William A. Bole presented a paper, which is published in Volume XII of the Transactions, which will show how thoroughly builders go into this matter. The test was of a Westinghouse 60 horse-power compound non-condensing engine. With the system of weighing water explained in that paper it is possible to cut out any fraction of a prolonged test, with a certainty of truth. I presume other builders use a similar system; I know Mr. Ball does. The method of the Westinghouse Machine Company is given because it is a matter of record through the publication of the paper referred to.

It is proposed to establish mail tubes between Brooklyn and New York. This plan will be a good one, if it will cut down by about thirty-six hours the time of the mail between the two cities. Under present arrangements, a letter mailed in Brooklyn gets to New York any time within the next three days.

It is said that the production of pig-iron in Canada last year amounted to only 21,772 tons, valued at $331,000.

Overloaded Engines.

BY W. H. WAKEMAN.

There is about as much pleasure in running an overloaded engine as there is in driving an overloaded horse over a muddy road; and when an engineer is in charge of such a plant, with all of its discouraging phases, it does not add to his pleasure to take up a mechanical paper, and read statements to the effect that an overloaded engine is more economical to run than an underloaded one is, and when he does read them, he often wonders if all of the effects were taken into consideration when the article was written. If the former develops a horse-power on 3½ pounds of coal per hour, and the latter requires 4 pounds, it is by no means a true indication that the former is the more economical of the two for the company who own it. An illustration of the way in which an engine came to have more than its share of work to do may be of interest.

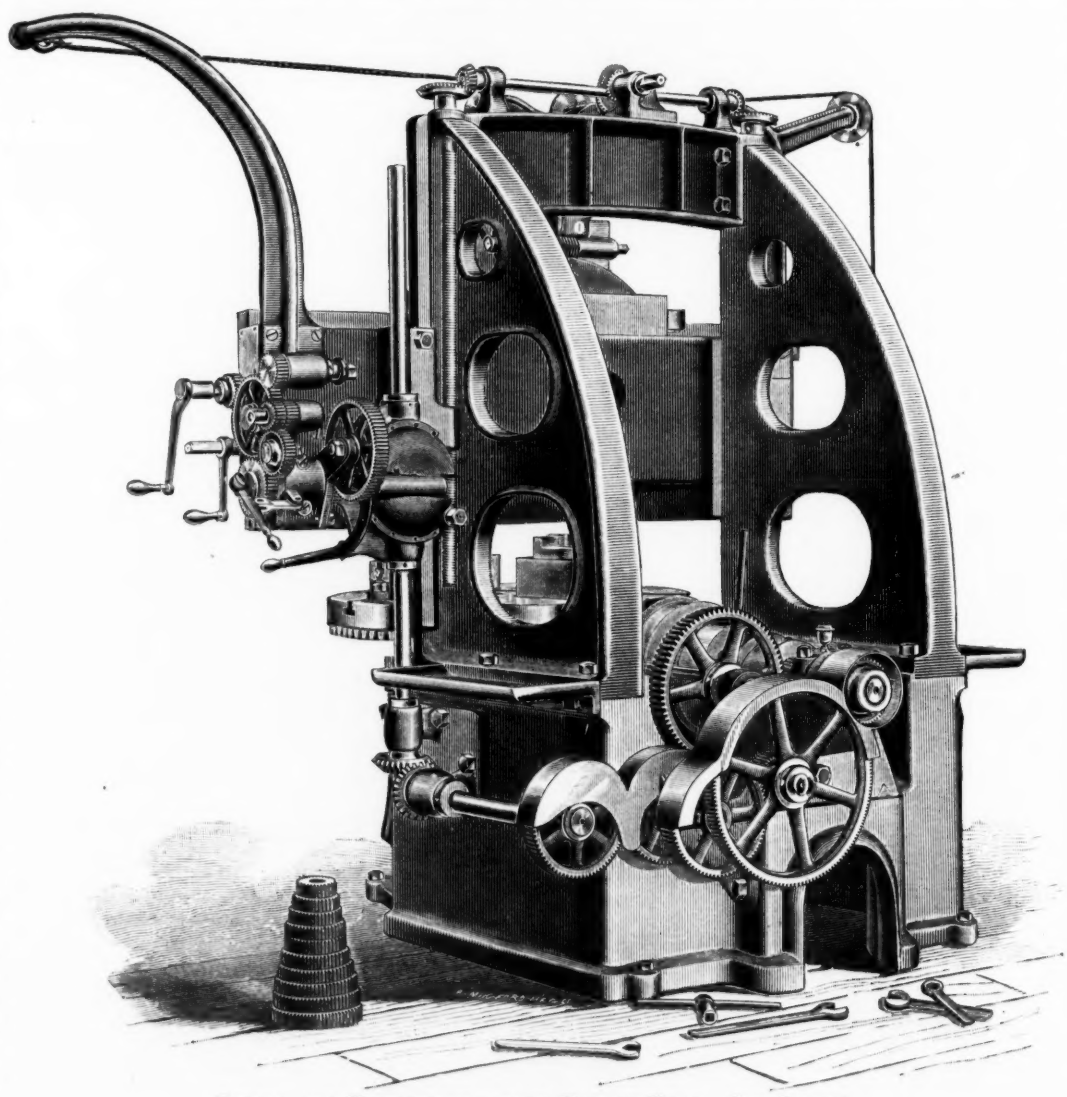
A certain firm, being about to put a factory into operation, decided that they needed a 125 horse-power engine, although how they came to arrive at this conclusion is not plain, unless they guessed at it. They went to an engine builder and inquired if he had an engine ready for shipment. He asked them what size they required, and was informed that they required one of 125 horse-power. He said that he had one of that size, and that was the only one that he had on hand, it being nearly finished. It was purchased, and found to have a cylinder 16 inches in diameter, and a stroke of 36 inches. Its speed was limited to 80 revolutions per minute, and after it was put into use it was demonstrated that no higher speed was practicable in that case, owing to existing conditions. Now, let us see whether or not this machine was capable of developing 125 horse-power in every day use. The area of the cylinder is 201 square inches, and the speed 480 feet per minute. $201 \times 480 = 96{,}480$. Dividing this by 33,000 we obtain the horse power constant, or, in other words, the power developed for each pound of mean effective pressure. $96{,}480 \div 33{,}000 = 2.9236$. Dividing the rating of the engine by this, we have the mean effective pressure necessary to develop it. $125 \div 2.9326 = 42.624$ pounds mean effective pressure.

Now, this is not an extraordinary pressure by any means, for some styles of engines, but is more than should be calculated on for this kind of a machine, as was soon demonstrated in practice, as the governor was charged with the duty of altering the point of cut-off to suit the load put on, by means of a link motion arrangement, which proved to be more than it could do easily, as the cut-off valves were not balanced, and consequently worked very hard. The boiler pressure calculated on in this case was 75 pounds, and 70 pounds is all that is safe to count on for the initial pressure. The limit of the cut-off on this engine was half stroke, and beyond this point no steam would be admitted to the cylinder, which is quite different from the Corliss engine, where, after the limit of cut-off is passed, the steam is admitted full stroke. When there was a load put on that was heavy enough to lengthen the point of cut-off to half stroke, the mean effective pressure was but 48 pounds, owing to wire drawing and the presence of 2 pounds back pressure. The great trouble was owing to the fact that, when this load was put on, the speed of the machine was reduced to 68 revolutions per minute, which, of course, was very unsatisfactory. The power that was developed then was as follows: Area, 201 square inches; speed, 408 feet; average pressure, exclusive of back pressure, 48 pounds. $201 \times 408 \times 48 \div 33{,}000 = 119$ horse-power. In this case, when it was at its best, the engine could develop less than its rated power, for, if it were called upon for more than 90 horse-power, the speed was very much reduced. These facts are given to show that what is an overload for one engine is not for another, even if the cylinder is the same size. The writer has cards in his possession, taken from a Corliss engine, in which the initial pressure is but two pounds less than the boiler pressure, and although the load is such as to prevent the valves from tripping at all, thus allowing the steam to follow up to $\frac{11}{12}$ of full stroke, at this point it is but ½ pound less than the initial pressure.

It may be well to remark that, in the case of the former engine, the steam pipe at no point between the boiler and the steam chest was less than 5 inches in diameter, so that the supply of steam was ample. Probably some engineers, looking at the cards taken with this load of 119 horse-power, would say that it was more economical to run so than it would be with a light load, and it may be so, as far as fuel alone is concerned; but when we take into consideration the fact that the speed is reduced 15 per cent., and consequently the output of the whole factory reduced just so much, although the wages of the employes and all other expenses were just as much as if the machinery was running up to speed, it will be plain that it would be better to have an underloaded engine, and have it run full speed continuously; and in every case when an engine is to be purchased, to run a factory one should be selected in which the governor only indicates where the cut-off is to take place, if it is of the fly-ball type, for if it has to shift the valves it cannot be as sensitive as it should be.

In the case of the engine under consideration, it may be of interest to note something of the belting that it was required to run.

The main belt is capable of transmitting 162 horse-power to the main shaft, and the pulleys on this shaft are carrying belts that can transmit power as follows: No. 1, 22 horse-power; No. 2, 12; No. 3, 22; No. 4, 8; No. 5, 14; No. 6, 51; No. 7, 20—a total



BORING AND TURNING-MILL WITH TURRET HEAD.—SEE PAGE 1.

of 149 horse-power—so that they could use all the power that the engine could develop.

In pleasing contrast to all this is a case of another engine which is in the same vicinity. It is of the Corliss type, and was bought for a 150 horse-power, but more machinery has been added, until it is now developing more than 200 horse-power, and with this load the speed is not lessened by even one revolution per minute. As the writer once talked with a man who claimed that a 150 horse-power engine could not develop 200 horse-power, and as other steam users may be of the same opinion, a few words on this subject may be of interest to them, although it is a matter well understood by engineers. In order to avoid terms not understood by the average mill owner, I will say that no reputable engine builder rates his engines at the full amount of power that they are capable of developing, and for the following reason: It is not economical to crowd work on to an engine, beyond what it is capable of doing easily, any more than it is in the case of a man, a horse, or any other animal. A good draft horse might be able to draw four tons of iron or stone at one time, under especially favorable conditions, but no one would think of selling him with a guarantee that he would draw a load weighing four tons every day in the year, and under all of the varied conditions to be found in city or country. So it is with an engine; for the reputable builder gives it a rating that allows of a large reserve force to fall back on in case of necessity, as, for instance, when starting up a heavy machine, or running something that takes a great deal of power, but which is in operation but a short time at once. It will readily be understood that it is very convenient to have this reserve, but it is not wise to have matters so arranged that the full power of the machine is required to run with the average load on. Let us take for illustration the case of a firm engaged in the manufacture of articles requiring large quantities of paper stock. Suppose that this firm discovered that their superintendent was in the habit of using three-quarters of the stock bought at heavy expense, and throwing the other quarter of it away. Would they be apt to approve of his action, or would there be "war in the camp"? We think that the "riot act" would be read to such a man without delay; and still that is just what many steam users are doing six days in each week with the steam that is generated at much expense.

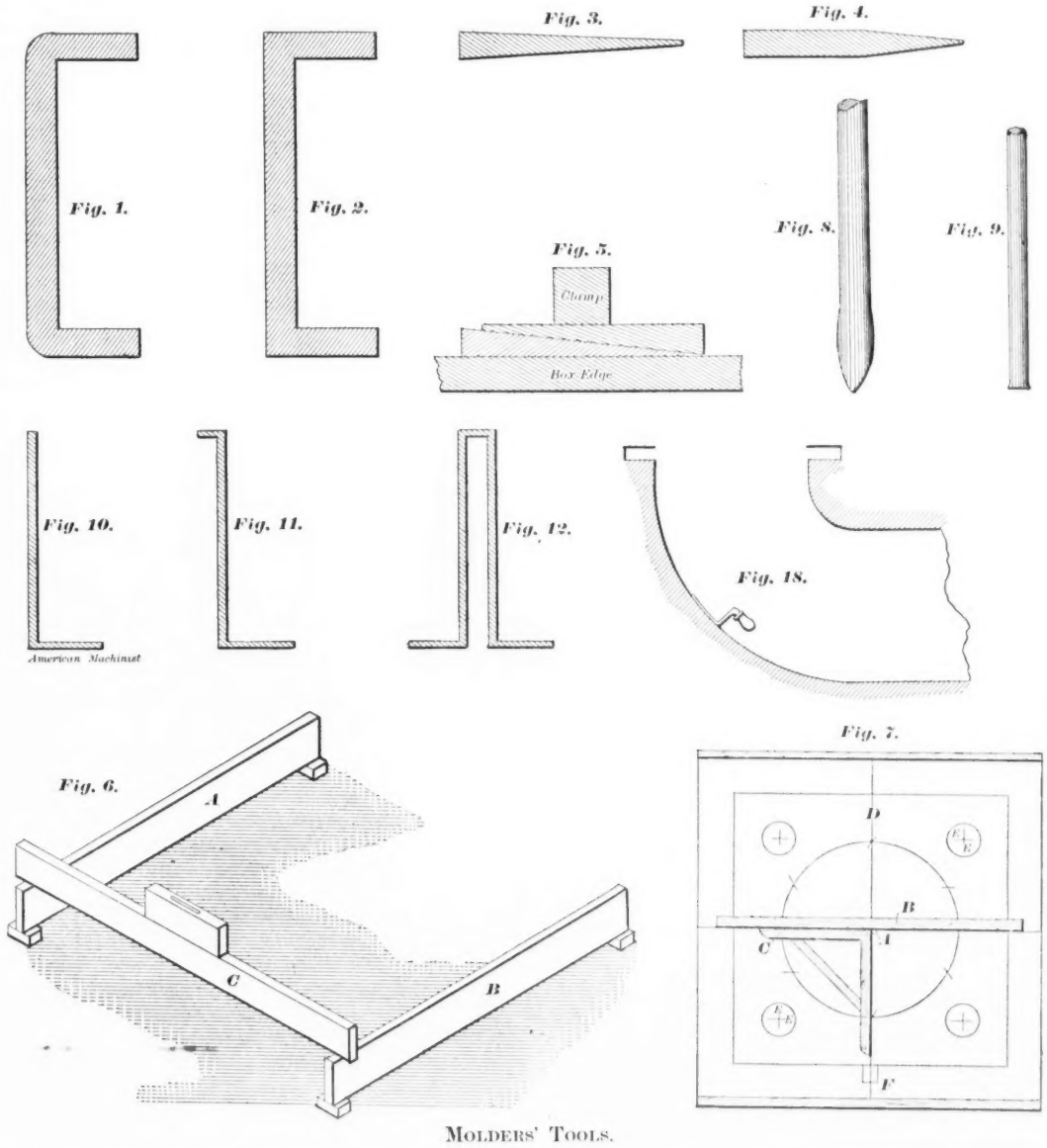
There is before me, as I write, an indicator card taken from an automatic engine located in another town. With a boiler pressure of 65 pounds there is a pressure of 61 pounds in the cylinder at the beginning of the stroke. It is overloaded to such an extent that the cut-off does not take place until the piston has traveled through two-thirds of the stroke. The supply from the boilers is then cut-off, and expansion begins, but the exhaust valve opens when there is a pressure of 35 pounds in the cylinder. The performance of this engine, so far as the machine inself is concerned, is very good, but when steam is admitted at 61 pounds pressure, and 35 pounds of this pressure is thrown away, is it not a parallel case to the one where the superintendent uses part of the paper stock and throws the rest away? And in both cases the part thrown away is just as good as any that was used, and is only wasted on account of mismanagement. This is a proper comparison, and is one that can be and has been demonstrated to be so. Is it not plain to even the casual observer, that, if the steam in this cylinder, instead of being exhausted into the atmosphere at a pressure of 35 pounds, were used further, until the pressure was reduced to 5 pounds, that much more work could be done with the same amount of coal? Let us see what the difference would be, provided a medium load was put on it. This engine also has a cylinder 16x36, and is run at 80 revolutions per minute. Therefore with an average pressure of 48 pounds (exclusive of back pressure), as shown by the card, it is developing 140 horse-power. Now, if we lighten the load until the cut-off takes place at one-third stroke, under the same conditions otherwise, the mean effective pressure would be 34 pounds, the pressure when the exhaust valve opens would be reduced to 13 pounds, and the engine would develop 99.4 horse-hower. The point that I wish to call attention to is this, that although the volume of steam admitted to the cylinder at the same pressure as before is but one-half of what it was with the heavy load, still the power developed is not reduced accordingly, for while the consumption of steam is reduced to 50 per cent. of the original, the power developed is reduced but 29 per cent., and it is my opinion that if the average mill owner could reduce the expense of any other item with so small effect, comparatively, on the product, he would not be slow in taking advantage of it.

However, it is not practicable to reduce the power needed in a majority of cases; therefore let us see what the effect would be if a larger engine were put in. The area of a 16-inch cylinder is 201 square inches, and as the steam is not cut off until 24 inches of the stroke is completed, to find the cubical contents we multiply 201 by 24 and find the product to be 4,824 cubic inches. Now, suppose that we substitute an 18-inch cylinder having the same stroke as before, and also the same speed? The area of an 18-inch cylinder is 254 square inches, and if we divide 4,824 by 254 the quotient will be 19, and this will be the number of inches of piston travel during which the steam will be admitted at each stroke. If we have an ideal engine, the mean effective pressure will be 46 pounds, and while using the same amount of steam as with the 16-inch cylinder we shall be able to develop $254 \times 480 \times 46 \div 33{,}000 = 169.9$ horse-power.

This is more power than we need to run the mill, for as 140 horse-power was all that was required before the change, it is all that will be needed now, therefore we can shorten the point of cut-off and save steam thereby, for to develop 140 horse-power now, we require a mean effective pressure of 37 pounds only, and if steam is admitted at 61 pounds and cut off at one-quarter stroke, we shall have it.

[The argument of our correspondent is in the right direction, but to get a mean effective pressure of 37 pounds in a non-condensing engine under the conditions named, the cut-off must be later than one-quarter stroke, and hence his figures that follow should be modified to that extent. It seems that his assumed saving of 50 per cent. should be reduced by about one-quarter.—ED].

Let us now briefly compare the results. With the 16x36-inch cylinder the volume of steam admitted at each stroke is 4,824 cubic inches, while with the 18x36 inch the volume is reduced to 2,286 cubic inches, or more than 50 per cent. Probably the cylinder condensation will be great in the latter case, but with the cut-off at one-quarter stroke it should not be excessive.



MOLDERS' TOOLS.

Molders' Tools—Their Use and Their Abuse.

BY S. BOLLAND.

Some one has said that "neither wise men nor fools could work without tools," and again, that "the poor workman is always finding fault with his tools"; but if his tools are the only things he assails we may leave him to his quarreling, and endeavor to do better ourselves by not only having the proper tools, but by having a full knowledge of their right use.

By some it is thought that a molder requires very few tools, and that "few" of a very simple kind; and some molders themselves boast of their ability to accomplish their work as well with a coat pocket full of tools, as others whose tool chest is packed full of them; but if these gentry are carefully watched it will be discovered that they are constantly borrowing from their neighbors to make up for their own deficiency.

Another thing we may notice here is, that no small number of our so-called journeymen molders really have no use for but very few tools; never having learned the proper use of them all, in consequence of which their jobs are turned out by hand, so to speak; in other words, made as well as their hands and a big square trowel can make them—a disgrace to the man as well as to the foundry that employs him.

It is my purpose herein to explain the simplest tools used in the trade, as I see almost every day a misuse made of them.

The shovel, for instance, to some men's minds is a thing of very small importance; no attention is paid to keeping it clean and well trimmed; they seem to forget that such neglect makes it much harder to dig with, or to clean off a joint, and, of course, the lives of both man and shovel are materially shortened thereby.

Brushes, riddles, sieves and bellows are equally as carelessly cared for, with a similar result. I advocate the method of supplying each molder with a full set of the articles above mentioned, holding him responsible for their safe keeping, and to be returned when he leaves.

It is customary for firms to supply these articles, but, excepting the shovels, they allow only a limited number of the others for general use; this is a mistake. I have tried both plans, and always found the former to work most profitably.

Clamps and wedges come under the head of tools supplied by the firm, and, simple though they seem, it is important that they be made correctly, otherwise disaster very frequently ensues.

Clamps should always be made with the view of being strong enough to resist the pressure exerted by the mold they are intended to secure. Very often we find them made with the corners rounded, as shown at Fig. 1; this is wrong, inasmuch as it reduces the part which is called upon to bear the most strain, to the weakest part of the clamp.

Clamps should always be made after the manner shown at Fig. 2, especially such as are made of cast-iron.

We come now to wedges, which ought, if possible, to be made of wrought-iron, and fashioned as shown at Fig. 3, not as we frequently find them, as seen at Fig. 4.

Those shown at Fig. 3 may be used two together for work requiring great security; Fig. 5 illustrates the method of using them; the others are simply valueless for critical jobs, and ought to be discarded.

A screw-driver and wrench, if not supplied by the firm, should be purchased for private use by every molder, the former being always at hand to loosen any part of a pattern that will facilitate the molding of the job; whilst the latter will save hours of time and much disappointment in hunting up the one belonging to the shop, which, strange to say, is always lost when wanted.

To a careful molder a pair of calipers is indispensable; how ridiculous the man appears, when, upon trying off his cope, he finds more or less of his upper bearings crushed off on account of the cores being too large, or, opposite to this, when his casting is examined the core is found out of the center, for the simple reason that his core was too small; either of which faults could have been avoided by a right use of the fool above mentioned.

Parallel straight-edges, level, compasses, trammels and square are usually supposed to be required by the loam molder only; I claim that every molder should possess these tools, and what is more, he ought to make

himself acquainted with their uses, for he knows not when he may be called upon to demonstrate whether he knows his business fully or not.

How simple one of our best green sand molders is made to appear, when, if called upon to make plates or rings for the loam molder, he stands aside, whilst the latter marks out the lines for his guidance. This ought to inspire every molder to learn all of his trade, and save him the disgrace which such a thing subjects him to.

For the guidance of such as are ignorant of, and desire to learn the use of the above mentioned tools, I will here describe the whole process of leveling a bed, and drawing thereon a simple job.

Fig. 6 explains the process of laying down the straight-edges preparatory to making the sand bed thereon.

The straight-edge *A* is first set level in the floor, resting on each end only; straight-edge *B* is then set similarly, at the required width; the parallel straight-edge *C* is set across the ends of both, as shown, and the end of *B* raised or lowered until the level shows it to be level with *A;* the level is then placed lengthwise on *B,* and the opposite end regulated until *B* is level also. The straight-edges are now secured, and the sand bed prepared in such a manner as will best suit the job as to depth and degree of hardness.

We will suppose a plate is to be made square at the outer, and round at the inner edges, having six equal divisions drawn on the inner circle, one lug in the middle on each of the four sides, and four round holes in some certain position cast in the body of the plate, as seen at Fig. 7.

After setting in a center peg *A*, with small hole for the point of the trammel to work in, lay straight-edge *B* parallel with the bed, and fair across the center at *A*, draw a line across, cutting the center hole, then set the square *C* against the straight-edge with the corner true to the center hole; keep the square exact in this position whilst you move the straight-edge and place it against the other side of the square, after which the square is removed, and line *D* is drawn. You now have two center lines at right angles to each other, from which lines you must measure for width and length of plate outside.

All that is now required for describing the four holes in the body of the plate is to ascertain their distance from the center lines, marking them off each way as shown at *E E;* the intersecting point of these lines will be the center of the holes required.

Because the sides are all equidistant from the center, the center lines themselves give the position of the lugs as seen at *F.*

All that now remains to be done is to set the trammels to the required radius, and draw the circle, the six divisions of which are obtained by marking off the length of the radius used to draw the circle. Any number of divisions of the circle in this proportion can be got by subdivision of the six, as twelve, twenty-four, forty-eight, etc.

It will be observed that the circle is divided in four by the center lines; subdivisions of these will give eight, sixteen, thirty-two, etc. To such as are scholars, this short lesson will be uninteresting, but to others, who are ignorant of geometry, I say, do not rest at this simple illustration; get books on the subject, and study hard; it will repay you.

A small water-pot with neat swab is a useful adjunct to a molder's outfit, providing it is used with discretion; a careful workman has one for his own private use to stiffen an edge where it is absolutely necessary, but should it be required to use more water than is good for the safety of the mold, he will see to it that the extra moisture is dried out before he casts.

Not so the careless or the incompetent workman; he uses water to save labor in finishing, and should his casting be measurably free from blisters and scabs, which is very rarely the case, it is certain that holes will be found in the upper surfaces, caused by the extraordinary amount of steam which is generated in such a damp mold, and which steam no ordinary amount of venting will carry away.

This brings us to the subject of vent wires and how to make them. Large vent wires should always have the point made as shown at Fig. 8; this enlarged point enters the sand freely, making a hole larger than the body of the wire, which follows after without friction. Smaller wires only need to be filed square at the end, which should be jumped up a little by a few blows end-wise; Fig. 9 gives an idea of what I mean.

Gaggers may be considered molders' tools, as they play a very important part in his work, very many castings being lost either from having too many or too few, or from not having the right kind. I have shown three kinds of gaggers at Figs. 10, 11 and 12. Where the amount of sand to be lifted is not too deep below the bars of the flask, Fig. 10 will serve the purpose. The principle involved is to secure, by ramming between the bars, the gaggers placed therein, so firmly that the weight of the hanging sand will not be sufficient to pull them out. Usually, when such is the case, recourse is had to chucking, but very much of the wood used for this purpose may be saved by using the gaggers shown at Figs. 11 and 12. These hang on the bars of the flask, thus making failure to lift impossible.

The subject of flasks has been treated by me in several articles published in the AMERICAN MACHINIST, to which I refer the reader, as I have treated that subject more fully there than I could be expected to in this writing.

We will now consider the subject of ramming or packing the sand against the pattern. This is accomplished by tools called rammers, which rammers, if used properly, will not only prevent the casting from swelling out of shape, but will also save considerable finishing by the molder. The wooden rammer shown at Fig. 13 is used by bench molders to ram small flasks and snaps with; this kind is preferred by most of them, because they can use one in each hand, if they choose, thereby materially lessening the length of time needed to ram up their flasks; but for general jobbing work, on the floor and in larger flasks, it is necessary to have rammers suited to the length of the molder who uses them, as he must invariably stand to his work. Fig. 14 shows the kind of rammer most suitable for floor work; it may be either double or single-ended, the shank may be of piping with ends cast or forged on, or the whole rammer may be forged solid. As stated, ramming is a very important operation, and the art should be learned thoroughly, as no amount of finishing will rectify faulty ramming. How often we see castings swelled in parts all along the side surfaces, or, if not swelled, blotches and scabs all over, both evils caused by inattention or inability, as the former results from ramming too far away from the pattern, and the latter from ramming too close, in all probability frequently striking the pattern with the rammer.

Again, how many comparatively good castings are marred by the ugly seam running along just where the one course of ramming joins the other.

By the use of Figs. 15 and 16 I shall endeavor to give a remedy for the evils spoken of; the figures show a round and square pipe or column bedded down in the floor or flask; it is at the joints *A*, *A*, where the seams are formed, by continuing the ramming without first making the connection between the two layers of sand good and solid. This is remedied by laying down the facing sand along the pattern, and carefully packing the joint with a smaller rammer made for the purpose, as seen at *B*, *B*, after which the facing can be pressed against the pattern, and backed with old sand; the ramming can then be continued as shown at *C*, *C*, taking care to reach the bottom at each stroke, and never allowing the rammer to come closer than two inches from the pattern.

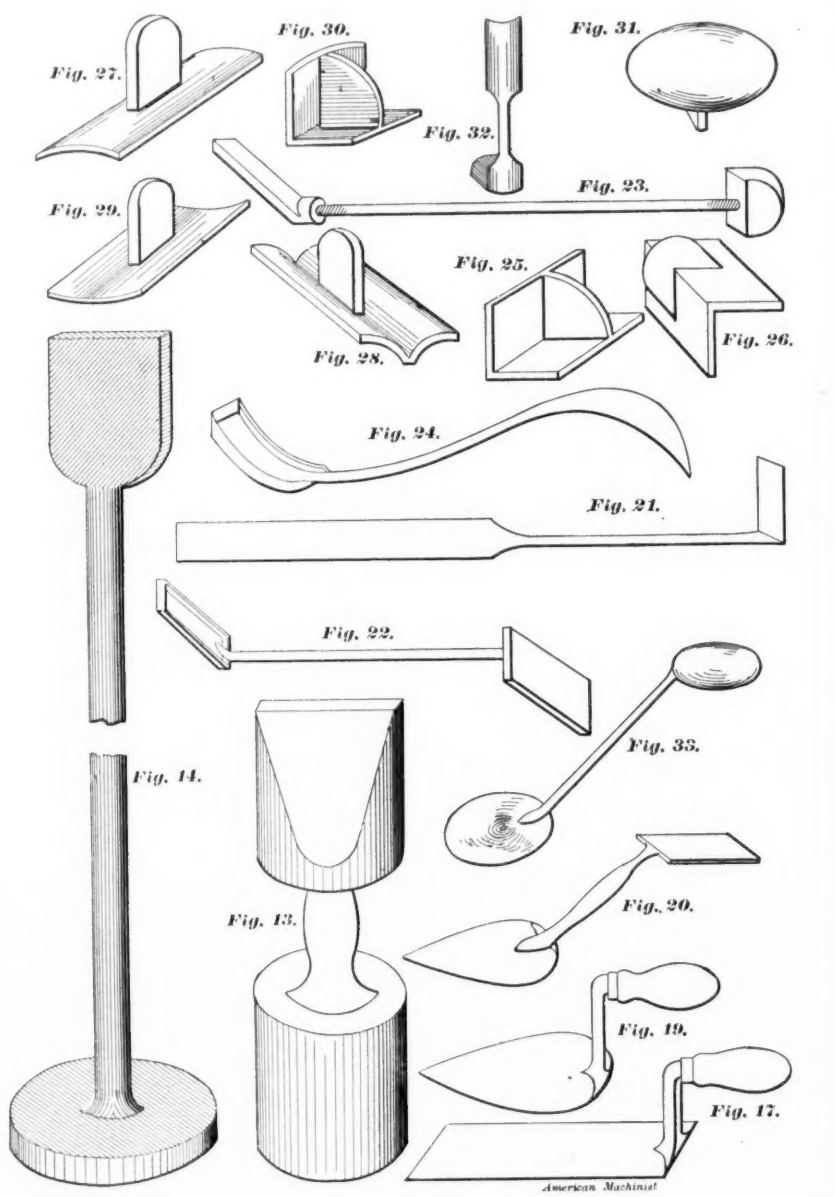
We come now to the more artistic class of tools, such as are usually called finishing tools, a full set of which it ought to be the pride of every molder, man or boy, to possess. The square trowel, Fig. 17, first claims our attention, because it is the most used. Of these there should be four, from four inches to seven inches long, of suitable widths according to length; they should be stiff and unyielding with an even surface on the face. This enables the molder to retain a perfectly even surface on the face of whatever part of the mold he smooths with them. This is worth consideration; for, painful as it is to relate, a careful inspection of some of our best work will reveal some very ugly marks, caused by finishing such surfaces with old round-faced trowels.

As these trowels wear down and become pliable, they are invaluable on curved surfaces, especially for loam and dry sand work. Fig. 18 shows how such tools may be used, the trowel being bent to suit the contour of an elbow pipe.

One heart trowel of good size, Fig. 19, will be found useful, as the point enables you to reach places impossible of access by the square trowel.

Fig. 20 shows a combination of heart and square, a very useful tool in good hands, and one which may be made to do good service.

I have many reasons for saying "careful" in reference to the use of molders' tools of all descriptions, for I am sorry to say that very many of our molders, when they obtain a very handy tool, take infinite delight in smoothing away on the surface, which it fits, either heedless or ignorant of the fact that by so doing they work the moisture, mixed with more or less clay, to the front. By and by this clayey surface clings to the tool and comes away in patches; the igno-



MOLDERS' TOOLS.—SEE PAGE 3.

rant molder then proceeds to fill up the bad spots with his trowel, smoothing it on the whole surface indiscriminately, good and bad spots alike; the pressure he exerts to press in this sand loosens the already overworked surface, which yields to the first touch of the molten iron, and an unsightly scar is the consequence. But irrespective of the above, it must be remembered that the hard clayey surface caused by over-smoothing with the tools expands as soon as the molten iron reaches it, and this expansion not being equal all over the surface, but by degrees as the mold fills up, the skin of the mold buckles, causing a very unsightly as well as undesirable surface on the casting.

Lifters shown at Fig. 21 ought to range from a quarter of an inch in width about six inches long, and advance in size by eighths up to two inches wide, lengths to suit. A very necessary adjunct to the lifter is the web smoothers, shown at Figs. 22 and 23; these should be made to match the lifters as nearly as possible; they can be either cast or forged in the form shown at Fig. 22, or threaded shanks of different lengths and stiffness can be procured, on which loose ends may be screwed, Fig. 23. The latter method is very advantageous, as almost every variety of tool may be cast at a slight cost; another advantage is that they are much less bulky than those which are forged or cast in one piece. These tools serve a good purpose, as they enable the molder to finish the bottom of a web with dispatch, and with greater nicety than it would be possible to do with the lifter alone.

Bead and flange tools, such as shown at Fig. 24, may be cast in one piece, or the ends may be loose, as just described.

Figs. 25 and 26 show smoothers with two faces at right angles to each other; one is concave and the other convex; these tools should only be used to give the final touch at the corners, after the mold has been made perfectly true.

Figs. 27 and 28 represent a set of flute tools, the one at 28 reaching the outer edge and a part of the curve on each side, the one at 27 finishing the curve.

Again, let me say that it is very tempting, especially to youth, to overwork the mold with these tools, they run along so easily, but avoid all smoothing until the faces have been all secured, and then do no more of it than is absolutely necessary.

Smoothers, such as shown at Fig. 29, are made of different sizes to fit all diameters of pipes, columns, etc. The one shown at Fig. 30 is similar to Fig. 25, excepting that one of its sides is circular, and serves to smooth a corner, one side of which is flat and the other round; this class of tool may be made to any angle or shape required.

Fig. 31 shows the form of tool required to fit the bends of elbow pipes, etc., and needs to be of several sizes to suit the diameter of pipe; for this purpose they are best egg-shaped, as seen; for globes, the outer edge must be made to a true circle.

Figs. 32 and 33 are simply modifications of the one seen at Fig. 22, any number of which may be made, in cast-iron or brass, to fit the job.

In conclusion, let me draw the attention of the molder to another class of tools, the cheapest of all, but, if rightly used, the most productive of real artistic work. I mean strips of wood to be used for re forming the broken surfaces, too frequently seen in the mold when a bad pattern is drawn from the sand, or when a bad lift occurs in the cope.

A simple example will best serve the purpose of illustration. Suppose Fig. 34 to represent the surface required, but the edge at *A* is broken, as seen at Fig. 35; never make the attempt to repair such a job by patching with the tool after the manner shown at Fig. 36, but have a long strip made the correct depth of the return, set it against the edge, as seen at Fig. 37, and make the corner good all along, after which the requisite tools may be used to finish with, and a true mold will result.

The above described method of finishing put into general practice will not only secure the best work, thereby gaining distinction for the molder, but will also facilitate production to a very appreciable extent, thus making it better for all parties concerned.

Sixteen-inch Light Drill Press.

With this we give an engraving of a light drill press recently brought out by F. A. Schumacher & Co., of Cincinnati, Ohio.

The engraving makes the construction of the press quite plain, and it will be noticed that, though all parts of the machine are

made quite light, to adapt it to the rapid drilling of small holes, the column is carried back opposite the table, to admit of holes being drilled in plates of sheet metal or other pieces of considerable size.

The largest drill intended to be used in the machine is ⅝″, but it will drill to the center of a 16″ circle.

The object of the arrangement of the levers shown is to leave the front of the machine unobstructed, and place the lever for feeding in a convenient position. They also serve to balance the spindle.

An endless round belt for driving is furnished with each machine.

The spindle is ⅝″ diameter, has 1¾″ traverse, and is fitted for the Morse taper No. 1. The table can be adjusted vertically a distance of 6″, and the maximum distance between it and the spindle is 9″. There are three changes of speed. The machine weighs about 225 pounds.

Automatic Blower Steam Flue Cleaner.

We present with this an illustration of a recently improved boiler flue cleaner.

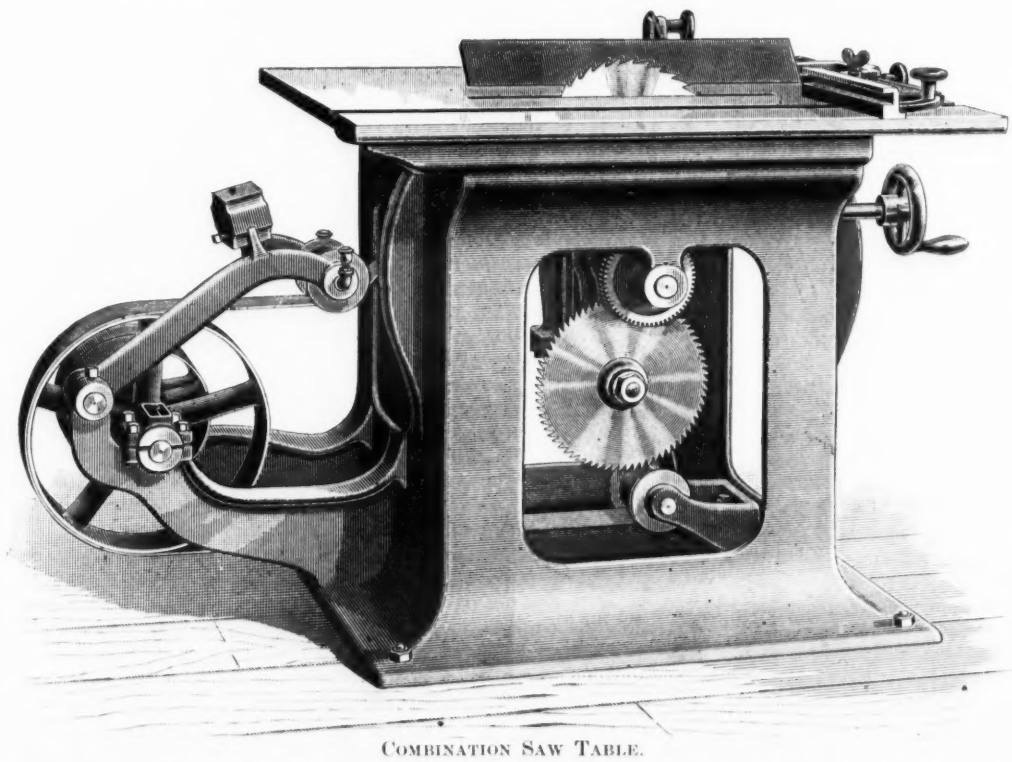
In using the cleaner, a full head of steam is turned on through the hose in the usual manner, but it does not blow until the head is pressed into the end of the flue. This pressure opens a valve in the head and the steam blows through, the valve automatically closing again when the head is taken away. By this means much of the dirt and unpleasantness of the operation of flue cleaning is done away with, since the scattering of ashes and soot by the steam during the changing from one flue to another is entirely avoided. The character of the jet can be changed by means of screws provided for that purpose, so that it may be adapted to either long or short flues. The valve is so made that steam does not pass between it and the seat, and the valve therefore remains tight. They are made in four sizes by Mr. J. L. Kelley, 1511 State street, Erie, Pa.

Combination Saw Table.

With this we give an illustration of a saw table for carrying both rip and cross-cut saws, which is also capable of being adapted for dado heads if required.

The frame of the machine is cast in one piece, and of such form as to secure rigidity, the saw arbors being mounted in a frame which revolves to bring either saw above the table, by means of worm gearing worked by the hand-wheel shown in front, and, of course, either saw will remain at any height to which it may be placed, so that grooves of any desired depth up to the full amount allowed by the size of the saw can be cut.

The table is made in two sections, the right-hand one being stationary for ripping. It is provided with a fence which can be conveniently and accurately set to any position, or at any angle with the saw, and is readily removed when desired. The cross-cutting table carries a cross-fence which can be set at any angle, and this table is adjustable with regard to the saw, so that dado heads can be used when desired. The countershaft is made part of the frame of the machine, and 14″ rip and cross-cut saws are furnished with it. The builders are the Indiana Machine Works, Fort Wayne, Ind.



COMBINATION SAW TABLE.

LETTERS FROM PRACTICAL MEN.

Thinks the Tool Maker not Responsible.

Editor American Machinist:

Referring to an article by A. P. Press, in the AMERICAN MACHINIST of June 25th, 1891, asking for a verdict on the case of a tool maker, who, having been furnished with a correct draft and sizes, an error of .005 was found in the die after 30,000 pieces had been made, although his work had been found to be correct by both inspector and the foreman, previous to the making of the 30,000 blanks.

We think that the case is a clear one; in our opinion, the tool maker is only responsible to the extent of the value of the die, and no further. His mistake lies in making the die wrong, but he is not necessarily responsible for the mistake of both inspector and the foreman, as it was their part of the business to see that all was correct before the 30,000 pieces were made. It is very much the same thing as if those 30,000 had, after being made, been subjected to a number of other expensive operations by other workmen, without due regard as to whether the previous work had been properly done or not; in the latter case such workmen would be directly responsible for the oversight, unless it could be proven that it would have been impossible on their part to see the error before they took the work in hand and finished it.

From this it follows that the cost of dies should be borne by the tool maker, and the loss due to making 30,000 pieces from a defective die should be divided equally between the inspector and the foreman, provided, however, that it was a legitimate part of the foreman's business to see that said dies were correct, otherwise, the whole cost of the blanks should fall on the inspector.

THE BUCHEL MACHINE WORKS.

[We have had several letters on this subject written in about the same spirit.]

A Tool Case—The Scrap-book Problem.

Editor American Machinist:

I know something about tool-boxes.

About ten years ago I procured, through the kindness of a small retail dry goods dealer, one of those walnut spool cases, with a bent glass front, two drawers, and a number of corrugated slides, for holding spools of cotton furnished to retailers by the Clark Co., of Newark, N. J. It cost me $2.50, and I found it well and strongly made and neatly put together. The little partitions that served to separate the spools were ripped out of all the slides, two of which were planed smooth, and lined with red plush to hold fine tools, such as scales, straight-edges, slide calipers, etc. The corrugations in the remaining slides were used to separate and keep in place a miscellaneous lot of small reamers, drills, counter bores, punches, etc., such as usually collect in a tool maker's kit. The upper and lower drawers contained hammers, monkey wrenches and similar bulky articles. Two short bolts or pins mounted on springs were fitted beneath the upper drawer in such a manner that the act of pulling down the glass front forced the bolts upward, and locked the upper drawer; two screw eyes fastened in the bottom of front dropped through slots in the upper part of the lower drawer case, so that two pins fastened in the front of the drawer shot into them to hold the front down, and finally a small combination lock—my own make—secured the lower drawer, and incidentally, the whole box. Two lifting handles at the sides completed the outfit, and it was certainly the cheapest, most convenient and neatest looking tool-box I ever saw. The particular tool needed could be selected without difficulty or delay, as every thing in the box laid right "at hand." The only drawback was the remarks it excited on

taking it into a new shop, "Where did that dude come from, with a glass front in his box?" A thin piece of walnut, steamed and bent into the place of the glass, removed even that objection.

I have also wrestled with the scrap-book problem, and this is my solution of that perplexity. Get several of these paper letter files that open somewhat like an accordion, and label them tool-room, machine shop, foundry, steam, mechanical engineering, or what you will; the pockets are all lettered alphabetically, and it is an easy matter to pencil the subdivisions of your subject in the flap opposite the right letter. Ram into these pockets your newspaper clippings, memoranda, etc. If your clipping is printed on both sides, and with a different subject, what of it? Keep a small block or pad of paper on your table, and make a note thus: "Lubricants, see Odontics"; shove the clipping into the "O" pocket, and the note in among the "L's," and that difficulty disappears. No mucilage is needed, and no dampening of paper. When you wish to look up a subject, dump the contents of the entire pocket on the table and sort it over. It packs away neatly in a trunk, and its size always bears a certain relation to its contents, which is not the case with a scrap-book until filled. If one of the files gets filled up, split the subject in the middle and buy another file. W. R. MACDONALD.

Compounding Centrifugal Pumps.

Editor American Machinist:

Mr. Lefebvre writes to the point on the subject of centrifugal pumps when he points out that they absorb least power when they are discharging least water.

Centrifugal pumps depend, of course, for their useful effect upon the tendency of water or any other ponderable substance to fly outwards from the center of a vortex. The maximum velocity of whirl possible is, of course, that of the tips of the fan blades. We may curve the vanes backward or forward with the idea of improving the action of a fan or pump, and to some extent we may do this, but any improvement effected is not due to any change of velocity, but to reduction of eddying and churning. Indeed, I have found by actual experiment that a fan so arranged as regards blade inclination, that the inner ends—as the inventor had it—skimmed a shaving off the cylinders of air entering at each side of the casing, gave a decidedly better result than an equal size of plain radial-bladed form, both fans working under exactly similar conditions, and in the same casing, that of the plain fan. Necessarily the pressure of the column issuing from a centrifugal pump is directly dependent on the tip velocity, and if we know the tip velocity we know the theoretical height of discharge of the pump, this height being that which would give the aforesaid tip velocity of discharge.

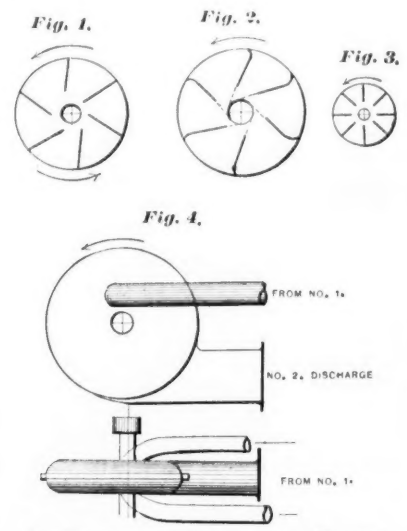
Thus a body falling from a height of 100 feet acquires a velocity of 80 feet per second, and a fan of 2 feet diameter would require to run at 764 revolutions per minute to have such a tip velocity as this, though it would require to run considerably faster to pump against a head of 100 feet, on account of loss of efficiency, so much of the water escaping without acquiring the maximum velocity.

If a pump be set to work against a resistance greater than it can overcome, it will at once absorb less power than when moving a stream of water, because the fan and the water in the pump casing all revolve together, and the only resistance to rotation is the water friction upon the casing, and the only work done is really the overcoming of this friction. Reduce the head of resistance so that the pump can overcome it, and at once water begins to flow through the pump, and, as each particle has to be put into motion, power is absorbed.

This action of a pump is a reason why centrifugals so often fail when made to draw up their water by "suction." Air gets into them, and being imponderable, or nearly so, cannot be energized by the fan, and all action ceases.

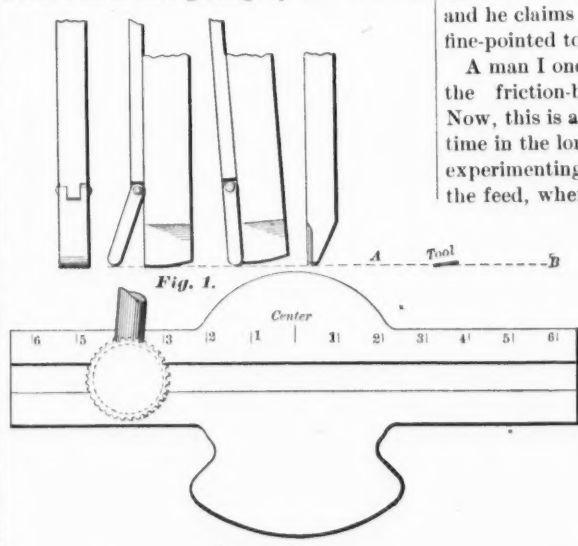
Hence water should, if possible, not be many feet below the pump.

When a centrifugal pump or fan is made with flat radial blades, it appears that the entering air or water must be struck a violent blow by the advancing blade, and so loss must arise by much churning. This, to some extent, is the case, but there is always more or less of a continuation to the outside of the casing of the vortex formed within it, and the approaching streams already begin a whirling motion as they approach the fan, and by so much avoid so severe a shock upon actual entry within the blade circle. Now, when the blades of a fan are set to



COMPOUNDING CENTRIFUGAL PUMPS.

skim off a shaving from the entering streams, by inclining the blades backward, as in Fig. 1, the tendency is to prevent the forward motion of the blades from being impressed upon the water or air shaved off, and which escapes past the tips of the vanes at a relatively backward velocity. Hence the idea of Fig. 2, which is supposed to hold the escaping particles, and impress on them the full tip velocity, the stream of fluid flowing up the face of the vane, compelling that near the tip to travel round the short forward curved portion. Any actual back curvature of the tips does not seem to be in accord with reason, nor can I see either that the tips of Fig. 2 type should incline forward more than the very slightest angle before the radial line. It is sometimes said that centrifugal pumps are not available above very moderate heights. This is true to the extent of our practice, because the high tip velocity demands either a very small inlet or involves too great an entering shock. Are there any sound reasons against the compound working of such pumps, by which I mean first getting up the water to



ABOUT PLANING.

say half its velocity in one pump and discharging it upon a second pump revolving at a higher velocity? Of course the entrance channels of the second pump would not be parallel to the axis of rotation, as is usual with centrifugal pumps, but would be arranged so that the column discharged from the first pump should enter the second pump in the direction of the fan rotation, as in Fig. 4. To my knowledge, this compound system of centrifugal pumping has never been tried, but I can see no reason why it should not, equally with compound steam working, be an effective means of extending the practical range of the centrifugal system. Of course the velocity of the inner ends of the vanes of the second fan should be equal to that of the tips of the first fan, and properly proportioned pipes should be employed between the two pipes, so as to avoid changes of velocity of flow.

Thus the stream will enter the second pump at the same speed as the vanes it encounters, and there will be no shock and comparatively little eddying, and the relative efficiency of the second pump, which does not have to change the flow of the water through an angle of 90°, will be greater than that of the first pump, which receives water in a direction 90° removed from the plane of discharge.

Excepting for simplicity and cheapness, or the idea of those two qualities, I cannot quite see why every centrifugal pump should not have guide vanes at its central openings, so that the direction of the entering steam should be made more favorable to efficiency. Such would be no less reasonable than the guide blades of all turbines, nor would the omission of these latter be more ill advised than the present system of centrifugal pump supply orifices.

W. H. BOOTH.

About Planing.

Editor American Machinist:

I saw a man planing a large plate of tool steel with what I call a peculiar kind of tool, and also an ingenious device for holding up the tool when swinging back. Fig. 1 shows the tool and "raising device."

I think the raising device will be understood, as it is only a flat piece of stock, hinged as shown, and clamped behind the tool. The tool is different from anything I ever saw before, for it cut on the side with a shearing cut. If the dotted line *A B* is the travel of platen, then the tool is set at the angle shown.

It seems to me it would be quite a nice job to get the tool just right to cut well, but this workman seemed to be doing an excellent job. I think the tool should start and leave the cut with an easy round, and that there should be a flat long enough to cut rather wider than the feed. The advantage he claimed for this tool was this: It is well known that in planing hard tool steel, that a wide-nosed tool will not cut a true surface; it will either slide over or gouge in, and so it is necessary to use a fine point and fine feed; then the tool wears fast, and so, in planing a wide piece, this will cause one side to be thicker than the other. This tool has considerable wearing surface, and he claims will cut just as true as any fine-pointed tool.

A man I once worked for had the faces of the friction-boxes graduated as shown. Now, this is a little thing to do, but it saves time in the long run. What is the use of experimenting with this every time you set the feed, when you can get what you want the first time trying? A man very soon learns how much feed a tooth of the ratchet wheel gives, and so can set just the feed he wants, without "monkeying." Because a man has run a planer for forty years without this, is no reason why he should not have it now.

A friend of mine went to work in an old-fashioned shop a while ago, and was set to work on an old boring-mill. He couldn't do a decent job on it to save his life, for the machine was all worn out. He complained to the boss (who was the proprietor as well) and received this reply: "Young man, that machine has been used in this shop for the last forty years, and you are the only one I ever heard complain of it."

He seemed to think that the forty years had improved it very much. Machine tools are not like wine; they do not get better with age, nor do methods either, unless we are on the lookout to improve them. A MECHANIC.

Glue and Gluing.

Editor American Machinist:

I have noticed that many wood-workers seem to look upon a pot of glue as something to be dealt with as if it were a medical compound, and the way such people mince with it whilst gluing is a caution. I hope the following remarks may be of use to some of your readers.

Often in mixing it is spoiled simply by putting in a quantity dry, then pouring water to cover, and getting it to boil as quickly as possible. The result is, some is cemented to the bottom, and the underside burnt, to say nothing about the brush clogged with half-dissolved glue.

I have found the following plan satisfactory:

My glue pot will hold one pound of glue, but I prefer to make only one-half at a time, because by constant heating the strenght is diminished. At least one hour before I want to use it I put it soaking in cold water; it will soon form a jelly, and when it has taken up all the water it will hold it can be put on the stove, and in fifteen minutes it will be ready for use.

As to consistency, experience is the best teacher. A good way is to stir, and lift the brush, or whatever you stir it with, about six inches high, and it should be thin enough to part into drops at that height, or when sizing end grain it should be thick enough to stand on the surface when dry.

A dirty pot is not a very pleasing sight, but almost every one gets it with the glue sticking to the sides. I once saw a way to obviate it. The inner pot had some fine holes drilled through its sides close under the rim, and as the water in the outer part boiled, the steam escaped through these holes, and caused all the glue sticking to the sides and edges to run down, thereby keeping it clean.

In the matter of making joints, I was taught to joint so that no light could be seen through any part, and all joints, after gluing, had to be rubbed together, but I had to come to this country to learn a better way, viz., to joint slightly hollow and pull together with clamps. My attention was called to the fact that a joint would always give way first at the ends, therefore we can well afford to have some little strain on those parts.

If in jointing thin stuff we fold the two pieces together, say face to face, and treat the edge as of one board, there will be no trouble about its being jointed square. I find a piece of basswood bark soaked, and the end bruised with the hammer, makes a very good glue brush. WM. NEWTON.

Puzzled.

Editor American Machinist:

In your issue of June 25th, under the heading "Some Experiments with a Screw Bolt," my attention was called to the pitch of a screw as being $\frac{22}{100}$" (four and one-half threads to the inch), another 22-inch pitch, but the number of threads per inch not quoted; and another as being 11-inch pitch (9 threads to the inch). Kindly inform me if the above is correct, and how it is worked out.

I have been harboring an idea that I knew a *little* about pitches, but if the above is correct (as I suppose it is), I confess that I am entirely ignorant on the subject.

The only pitch in that article that strikes *me* as being correct is .25 inch pitch (4 threads to the inch.)

Kindly give me the required information and oblige, C. W. W.

[Our correspondent's misunderstanding arises from the fact that decimal points were in some way omitted where they should have been inserted. The following pitches were meant: .22" and .11". These are correct for the number of threads per inch given, to the nearest .01".—ED.]

Still the fight goes on between the electric companies and the authorities in relation to putting wires underground. Exactly what the electric companies expect to gain in this matter is not plain. To an outsider it looks as if they were simply hindering the spreading of their business.

Boring, Drilling and Milling Machine.

In our issue of Feb. 6, 1890, we illustrated a machine built by the Niles Tool Works, for boring, drilling and milling operations on work of considerable size, where it is important to avoid handling or moving it about, so far as possible. In our issue of April 30th we referred to one of these machines, seen at the shops of the Hackney Hammer Co., which was fitted with a revolving table on which work was placed, so that any side of it could be presented to the spindle without the necessity for unclamping it. With this we give an illustration of the machine fitted with this revolving table.

The piece of work shown on the bed is part of a machine built by the Niles Works, and the engraving shows the method of using it on such work. Such a piece can be drilled, bored and milled while in position, with the assurance that the different parts of the work will be true with each other. The spindle of the machine will reach any point in a surface 9 feet long and 6 feet high, there being rapid transit motions vertically and horizontally, as well as a great range of feed motions. Instead of the circular table, a compound table, *i. e.*, a table having two slides and actuating screws at right angles to each other, is furnished when desired, or there may be a combination of the two, the circular table being placed above the compound one.

Fig. 2 shows the machine with square table at work milling the vertical guides for the frame of a refrigerating machine—a job which, as will be seen, would require a very large planer, that would even then be working at a disadvantage when compared with this machine, aside from the fact that the main bearing can be bored and faced at the same setting. The illustrations are typical of a very large range of work to which the machines are adapted, and for which they will be found very efficient.

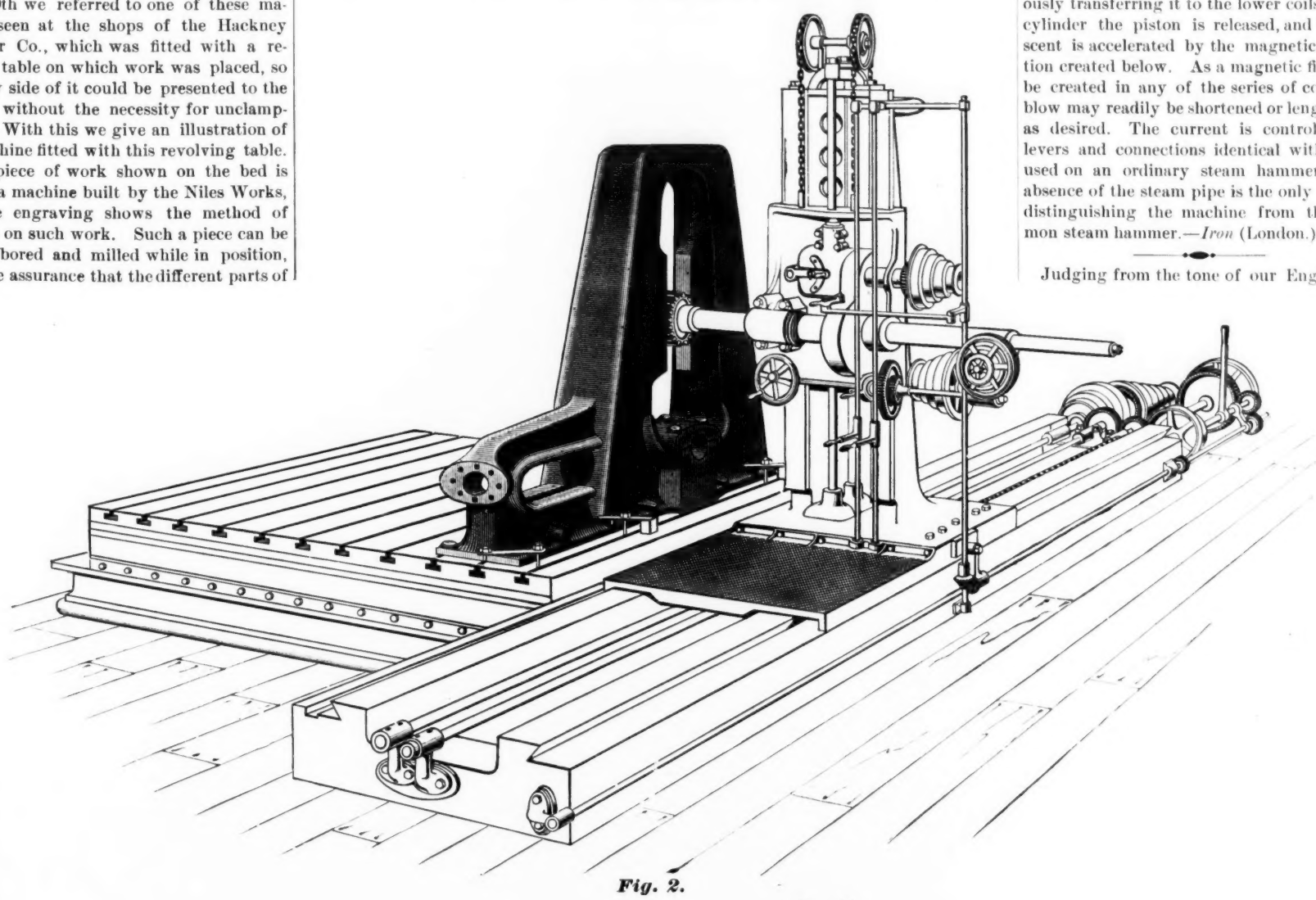
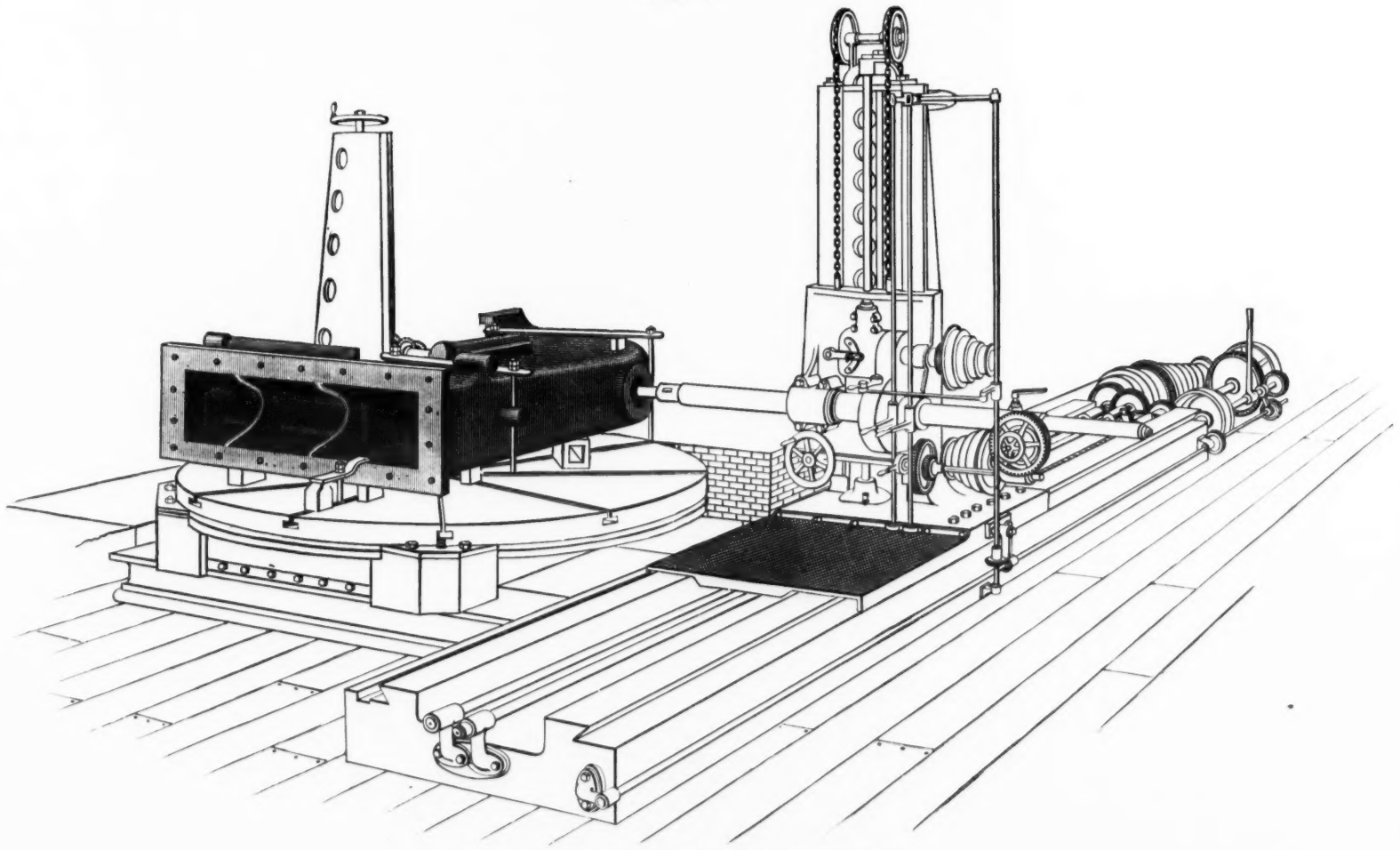


Fig. 2.



BORING, DRILLING AND MILLING MACHINE.—FIG. 1.

An Electric Hammer.

An electric-power hammer has been devised, which represents a radically new application of electro-magnetic principles. In general design the hammer is similar to the steam hammer, with its vertical cylinder mounted upon an arched frame, and the rising and falling piston by which the hammer head is carried. The novelty of the apparatus lies in the substitution of electro-magnetic power for steam by a slight and very simple modification of the mechanism. The piston is of magnetic material, and the cylinder is composed of a series of coils, through each of which an electric current may be passed separately. The apparatus is virtually an immense electro-magnet, the cylinder being the coil and the piston answering to the core. The passage of an electric current through the coils forming the upper part of the cylinder raises the piston into the magnetic field thus created. By cutting off the current and simultaneously transferring it to the lower coils of the cylinder the piston is released, and its descent is accelerated by the magnetic attraction created below. As a magnetic field can be created in any of the series of coils, the blow may readily be shortened or lengthened as desired. The current is controlled by levers and connections identical with those used on an ordinary steam hammer. The absence of the steam pipe is the only feature distinguishing the machine from the common steam hammer.—*Iron* (London.)

Judging from the tone of our English exchanges, the engineering trades are recovering from the depression of the past few months.

An English engineer has devised a diving dress which entirely relieves the wearer from the pressure of water. It is entirely of rigid materials, the joints being ball and socket.

AMERICAN MACHINIST

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☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, JULY 16, 1891.

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Rules in Railroading.

At this writing it is impossible to say where the blame for the frightful wreck which took place on the 3d inst., at Ravenna, O., should be laid. But the indications, so far, are that the direct cause of the accident was the failure of the rear brakeman of the passenger train to go back with a lantern to protect the rear of the train while standing for some slight repairs to the engine.

A well known railroad man declares that one of the most useful inventions that can be thought of in connection with operative railroading is one that will automatically take the rear brakeman by the nape of the neck, and shoot him back from the train a sufficient distance to protect it, when, for any reason, an unusual stop is made. He declares, as a result of considerable experience with the genus brakeman, that nothing short of this will suffice to make it at all sure that trains will be protected under such circumstances, because nothing short of some such device can compel brakemen to go back a proper distance with flag or lantern.

But it is also true that personal aversion to running is not the only reason for this. There is nothing that is more thoroughly drilled into trainmen than the fact that they are expected to make time; and they soon learn that, unless they do make time, things are made uncomfortable for them, or other men are put on the trains who can make time. This, of course, is proper enough so far as it goes, especially when we consider that delayed trains are one of the most fruitful causes of collisions and other accidents. But running back to a considerable distance from the rear of a train usually operates to prolong the stop, for the brakeman must be called in and given time to reach the train again after repairs have been made or the difficulty removed; and it is safe to say that a wish to avoid this delay is one of the causes of failure to go back to a proper distance. No one who knows anything of railroading thinks that all the rules laid down for the movement of trains are expected to be observed at all times, and one of the chief reasons for this is that many of them are utterly inconsistent with what is expected of the men, in the way of getting trains over the road. There is scarcely a road in the country whose officers do not practically know that trains are at least occasionally run on time under circumstances that would make it impossible to so run them without violating some of the rules of the company. No objection to this violation is heard until an accident occurs.

It would be an excellent thing if there could be some agreement among trainmen to strictly observe all rules under all circumstances. Not only would this probably tend directly toward the lessening of accidents, but it would in many cases cause a revision of rules, which would make it practicable to observe them, and yet satisfy the officers with regard to making time, thus securing greater uniformity and system, and leaving less to individual discretion—or the lack of it.

Visits.

We find in a recent number of the *Railway Review* a very complimentary allusion to the series of "Letters from Uncle Ben" recently published in our columns, and a special mention of his advice to the new foreman to insist upon getting away from his shop often enough to keep in touch with the current mechanical practice of the time.

We agree with our contemporary that this is a matter of very great importance to men who are occupying positions of responsibility in connection with mechanical work. The changes which are constantly taking place in the methods of doing work in machine shops are in this country much greater and more rapid than would be thought possible by those who do not take some pains to keep track of them, and it is as easy as anything can be to fall entirely behind the times. Of all the known methods of falling behind, none offers greater facilities than carefully avoiding visits to other shops, and talks with men whose experience has been in other directions. And the main benefits derived from such visits are not directly in things seen which can be used in the form seen, but in learning that there are many ways of doing things, that no particular way can be considered as absolutely the best way, and that what may be the best way today may be one of the worst a few days hence.

It is strictly true that few men can keep well abreast of the times and continue to be really valuable men, so far as holding positions of responsibility is concerned, who do not take some means of knowing what other men in other places, and under other circumstances, are doing. Such knowledge acts as a direct stimulus and inspiration, without which very few men indeed can long remain at their best, or do themselves full justice.

A trade paper such as this can do much to help men in keeping up with the times, but an occasional trip with a change of scene should be secured if possible.

And it is to be noted that such a means of keeping "posted" is very advantageous to the concern with which the visitor is connected, and that it will usually pay that concern to see to it that opportunities are afforded for such excursions whenever possible. It is much better to preserve or increase the usefulness of a man already employed than to allow him to become fossilized, so that a new man, unacquainted with the particular work done, becomes a necessity.

Personal.

Mr. John H. Barr, professor of mechanical engineering at the University of Minnesota, has accepted a call to Sibley College, Cornell University, and goes to Ithaca, next fall, to take charge of the work in machine design and senior work in construction. Mr. Barr is M. S. of the University of Minnesota, and M. E. in the same institution, and has taken the degree of M. M. E. by graduate work at Cornell. He has had a large and varied practical experience in responsible positions, and his numerous friends will wish him success in his new field; he doubtless goes to his new position prepared to do work profitable to his pupils and to the college.

It will doubtless be remembered that some time ago we had something to say, not upon the superiority of electricity over the rope for executions, but upon the nonsense uttered with regard to the use of electricity for that purpose. It was claimed that men could not with any certainty be killed by an electric shock, and that to attempt to so kill them was disgraceful, and would "degrade a noble science." Four men have recently been executed at Sing Sing by electricity, and there is every reason to believe that the operation was entirely successful in every respect. This disposes of the uncertainty argument. We predict that the "degradation" argument will prove to be equally unfounded.

Literary Notes.

THE ARITHMETIC OF ELECTRICITY. A Manual of Electrical Calculations by Arithmetical Methods, including numerous rules, examples and tables in the field of practical electrical engineering and experimenting. By T. O'Conor Sloane, Ph. D., Author of Home Experiments in Science, etc.

In this little book of 138 pages the problems of electrical engineering and practical operations are investigated on an arithmetical basis. The electrical calculations are reduced to a series of rules, of very simple form, and involving only ordinary arithmetic; each rule is illustrated by one or more practical problems, with detailed solution of each one. In addition to the arithmetical methods, after each of such rules, where useful and practicable, is given its statement as an algebraic formula. The book also contains a series of useful tables, relating to the following subjects: Equivalents of units of length, equivalents of units of area, equivalents of units of volume, equivalents of units of weight, equivalents of units of energy and work, specific resistances in michroms and of coefficients of specific resistances of metals, relative resistance and conductance of pure copper at different temperatures, American wire gauge table, chemical and thermo-chemical equivalents, magnetization and magnetic traction, permeability of wrought and cast-iron, magnetic reluctance of air between two parallel cylinders of iron, and table of sixth roots. The whole forms a useful book of reference for the working electrician, scientific teacher, student and amateur who possesses some knowledge of electricity. The book is published by Norman W. Henley & Co., 150 Nassau street, New York. Price, $1.

We have received from *The Engineer* (London) a pamphlet reprinted from that paper, giving an account of the history and construction of H. M. S. Victory. It was desired to have this old ship, in which Nelson fought and died, form a part of the naval exhibition, but the danger of moving her was thought to be too great, so a full-sized model was constructed. The pamphlet referred to describes this model as well as the ship itself, several engravings helping to make the subject clear. The whole matter, including an account of Nelson's death, is extremely interesting. The price of the pamphlet, of about forty large pages, is sixpence (twelve cents).

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(309) W. T. S., Carthage, N. Y., writes: I would like to join the N. A. S. E., but I do not know where to go, or where to write to for information or rules to join the association. *A.*—Write to President J. J. Illingworth, Utica, N. Y.

(310) J. T. M., Princeton, Ind., writes: I have been asked several times for the address of some good author on amateur lathe work. Can you name an author or a book treating on this subject? *A.*—Turning Lathes: a Manual for Technical Schools and Apprentices, by James Lukin, B. A., may suit you.

(311) M., Schenectady, N. Y., writes: Will you kindly inform me of the best method of packing a pneumatic press? I have several of them to build varying in diameter from 13 to 48 inches, and I imagine there might be some better method than the usual stuffing-box for such large diameters. *A.*—We do not know of any better method.

(312) H. W. C., Boston, Mass., asks: What part of a horizontal boiler shell has to sustain the most pressure? I believe it was stated in your paper that the bottom of the shell had to sustain the weight of water in addition to the steam pressure, which will make the pressure on the bottom of the shell greater than that at the top. *A.*—Correct. 2. Will an injector feed a boiler above the water line when the boiler is in action? *A.*—Yes.

(313) C. W., New York, writes: I have a smoke-stack to paint; its height is fifty-five feet above the roof of the building, and guys run up to within twenty feet of the top. How can I get to the top without a scaffold? There is no opening at the bottom of the pipe, and the plant cannot shut down; it runs almost continually. Diameter of pipe is 4 feet 8 inches. The slope of the roof is about 15 degrees. *A.*—Under the given conditions we do not see any way of getting to the top of the chimney without a scaffold.

(314) J. T. D., Portsmouth, Va., writes: Kindly tell me how to set the valves on a large horizontal compound double-pump (Knowles). The trouble with this pump is, that the left-hand piston (standing at steam end and looking towards the water end) does not make a full stroke. It is two inches less than the left-hand side. *A.*—It seems to us that the better way is to write to the manufacturers of the pump; they have had more experience in this class of work than we have had; they are in better position to advise you, and will undoubtedly take pleasure in doing so.

(315) G. A. C., Toledo, Ohio, writes: In regard to the steam launch published in your issue of June 25, will you please inform me what the boiler pressure should be, how many revolutions the engine should make, and about at what speed the launch could run. *A.*—Boiler pressure, 100 pounds; number of revolutions, about 400; speed of launch, from 9 to 10 miles an hour. 2. Can I get blue prints of drawings, and the specifications, from Mr. Gielow, from which I can have the boat built? *A.*—Yes; address H. J. Gielow, engineer and naval architect, 29 Broadway, New York.

(316) McB., Philadelphia, Pa., writes: Kindly inform me through your columns as to the best record of the number of pounds or gallons of water evaporated per hour per square foot of heating surface, pressure of steam, etc. *A.*—We are not aware that there is such a record kept; nothing satisfactory could be gained by it, because the rate of evaporation per square foot of heating surface not only varies with the type of boiler, but it also varies in each boiler; the thickness of the sheet will also affect the evaporation. Ordinarily the evaporation per square foot of heating surface varies from 1.5 to 9 pounds of water per hour.

(317) T. C., Chicago, Ill., writes: Can you recommend a book containing examples of fancy lettering, such as are used in drawing offices? I have one, but would like to get others. *A.*—System of Easy Lettering, by I. H. Cromwell. 2. Can you recommend a book which treats in a clear and correct way on worm gears. All the books that I have got fight shy of this. I want something suitable for a mechanic rather than for a student? *A.*—Practical Treatise on Gearing, by Brown & Sharpe Manufacturing Company, Providence, R. I. Odontics, by G. B. Grant, Lexington Mass. 3. I am a pattern maker, but I want to be posted on the elements of machine design and shop practice. What books would you recommend? *A.*—See our issue of February 19, page 4, current volume.

(318) C. G. S., Columbus, Ga., writes: We are in a position to get a good many pieces of broken round coils of pipe as used in ice machines, and we would like you to tell us how to connect them so as to make a boiler for a boat engine 3½ by 5 inches. What size boat can be used with this engine in a river with a four-mile current, and what speed can we expect? Also can you refer us to some one who can do this for us? *A.*—Before we can advise you in regard to the construction of the boiler we must know the size of the coil and size of pipe. A non-condensing engine of the size given will drive a boat 20 feet long; breadth, 5 feet; depth, 2 feet 9 inches. The speed will depend on the fineness of the lines of the boat; against the current you may obtain a speed of three to four miles per hour. Any builder of marine engines and boilers will place the machinery and boiler in the boat for you.

(319) W. O. J., Gladstone, Minn., writes: Your issue of June 4th contains a report of a meeting of the Franklin Institute, in which Prof. Coleman Sellers made allusions to the advantages to be obtained by heating compressed air before using. Can you give me any pointers about this? Also, will it take larger port openings for using compressed air than it will steam under the same conditions? *A.*—It is fair to assume that compressed air is nearly, if not quite saturated when it comes to the engine. The chief disadvantage in the use of moist compressed air, is that the low temperature experienced when the range of pressures is considerable, causes the moisture to freeze in the cylinder and clog the exhaust valves. Freezing of the moisture may be prevented by injecting steam or hot water into the supply pipe or the cylinder, or the air may be heated by passing it through externally heated pipes, or by some similar device. By heating the air a greater ratio of expansion may be obtained, thereby increasing the efficiency of the engine. The areas of the port openings are usually equal to those of the ports in a steam engine.

(320) H. G. W., ——, writes: Kindly furnish some information to a reader through your Question and Answer columns regarding the manner of computing the pressure of steam necessary to run certain machinery at certain revolutions, notably vacuum pumps, in which the water enters the pump through the vapor pipe. *A.*—Before the steam pressure can be found, the power required to drive the machinery must be known, and we must also know the power required to run the engine. Since, in many cases, neither of these can be accurately determined, an approximation of the required mean effective steam pressure can only be made. If we understand your question correctly, the problem simply resolves itself into this: The diameter of cylinder, stroke, number of revolutions, and indicated horse-power being given, it is required to find the mean effective steam pressure. Let P denote the mean effective pressure per square inch of piston; L the length of stroke in feet per minute; A the area of the cylinder in square inches; N the number of strokes per minute, which is equal to twice the number of revolutions in the same time; and *I. H. P.* the indicated horse-power. Then for finding P we have the following formula:

$$P = \frac{I.\,H.\,P. \times 33{,}000}{L \times A \times N}.$$

To illustrate: The diameter of the cylinder is 14 inches; stroke, 1.5 feet; number of revolutions per minute, 150; indicated horse-power, 105; find the mean effective pressure. Remembering that the area A of the cylinder is 153.94 square inches, and the number of strokes equal to $150 \times 2 = 300$, and then substituting for the symbols their values, we have,

$$P = \frac{105 \times 33{,}000}{1.5 \times 153.94 \times 300} = 50 \text{ pounds}$$

per square inch.

(321) Apprentice, Topeka, Kan., writes: Please inform me if there is any formula by which the speed of a ship can be calculated from displacement in tons, length, beam, draught, and the indicated horse-power. *A.*—The following rule has been used for many years by shipbuilders. It is still used by naval architects, and it is not altogether set aside by any, as in experienced hands it forms a good check on the newer methods, and can be used by itself with fewer data than are required when rules based on wetted skin are employed. Multiply the indicated horse-power by a constant; call this product A. Square the displacement in tons, and find the cube root of the result. Divide product A by the cube root found as above; the cube root of this last quotient will be the speed in knots per hour. This rule is expressed in symbols as follows:

$$S = \frac{I.\,H.\,P. \times C}{\sqrt[3]{D^2}}$$

in which S denotes the speed in knots per hour; D the displacement in tons; and C the so-called constant; its value depends on the length of ship, shape of lines, and speed. For instance, for ships 400 feet long, finely shaped, running at a speed of 15 to 17 knots per hour, the value of C is 240. For ships under 200 feet long, fairly shaped, running at 9 to 10 knots per hour, its value is 200. Consequently the usefulness of the rule depends on the information in the hands of the user, and on his discretion in choosing the value of the constant C. To illustrate: What will be the speed of a boat 35 feet long, fairly shaped, displacement 9 tons? The indicated horse-power is 25. In this case we may adopt a value of 200 for C. Now substituting for the symbols in the formula their values, we have:

$$S = \frac{25 \times 200}{\sqrt[3]{9^2}} = \frac{5{,}000}{4.32}$$

= 1,159, which is the cube of the speed. The cube root of this is nearly 10½, which is the speed in knots per hour.

(322) B. B., Cedar Keys, Florida, writes: In looking over a back number of the AMERICAN MACHINIST I came across a question asked by myself. The question was: In hanging a boiler 30 inches diameter, 36 feet in length, at what distance from each end should the hanger straps be placed, so as to equalize the stress, using only two hangers? You say one-quarter of the whole length of boiler, that is, 9 feet from each end, not taking into account the weight of head, etc. The answer did not satisfy me, nor am I yet convinced that it is right. Now, it appears to me that the strength of the boiler between the hangers should be taken into consideration, thus placing the hangers nearer each end, but what distance, I don't know, and this is what I wish to know. If the boiler, which is 36 feet in length, was parted in the middle, then we would place the straps 9 feet from each end, but as it is joined together, it looks to me as if there would be a difference. As far as I know, the one-quarter distance is the general rule, but I believe it to be wrong. *A.*—In practical cases of this kind, we may assume that the boiler does not sag or deflect between the hangers. Under these conditions, the answer as given is correct. You agree that, if the boiler is parted in the middle, the hanger should be placed in the center of each section; if the ends of the section do not deflect, then the mere fact of joining the section cannot make any difference to the stress. In practice, this deflection is so small that it may be neglected. 2. What is meant by the highest forge heat? For example, "Nickel melts at the highest forge heat." *A.*—The term highest forge heat is very indefinite. We should understand it to mean the greatest heat obtainable in an ordinary forge. 3. The question is often asked: Does a crosshead of an engine stop in passing the center? Of course it is generally agreed upon that it does. But is the duration greater when the engine is running at a slow than at a faster one? I maintain that there is no difference, and that I doubt if the time could be measured. My friend says there is. Which is right? *A.*—This has been a matter of dispute, and much valuable time has been wasted in arguing on this subject, which, even had a satisfactory conclusion been arrived at, is of no practical importance.

(323) C. P. S., ——, Mich., writes: Kindly inform me through your columns the best way to find the center of an engine. *A.*—Upon the side or face of the crank disk or fly wheel describe an arc $b\,c$, as shown in Fig. 1; all points in this arc should of course be at an equal distance from the center of the shaft. Place the crank at any convenient distance A above the center, and from any convenient fixed point G on the floor, or frame of engine, and with a tram T mark off a point d on the arc $b\,c$; also, while in this position, scribe a line H on the crosshead and guides. Turn the crank below the center; this will cause the line H on the crosshead to move away from its mate on the slide, and finally return to it; when both

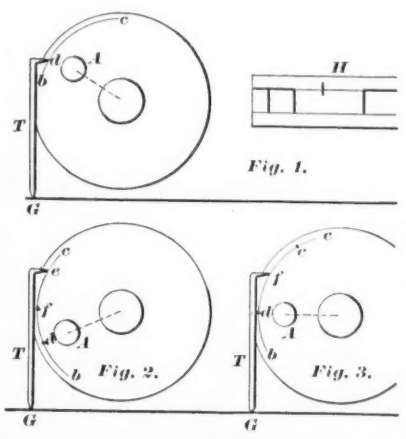


Fig. 1.

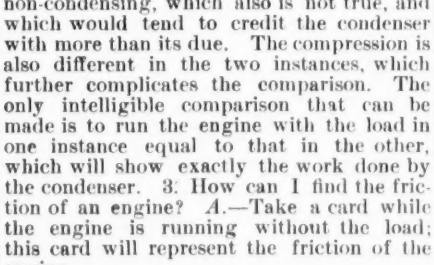


Fig. 2.

Fig. 3.

are again in line, stop turning the crank; it will then have the position as shown at A in Fig. 2. From the fixed point G, and with the tram T, mark off a point e on the arc $b\,c$. With the dividers find the point f midway between e and d; and turn the crank so that the point of the tram will be on the point f, as shown in Fig. 3; the crank will then be on one of its dead centers. In a similar way the other dead center is found. One precaution is necessary in turning the crank to its dead center—move the crank a little above the center, and then back until the point f coincides with the end of the tram. The reason for this is to make the crank-pin press against the same brass for all positions of the crank, so as to obviate any error that might arise from looseness in the crank-pin and crosshead pin bearings. 2. How can I compute the work done by a condenser? *A.*—The work is computed from the indicator card; the area below the atmospheric line represents the work done by the condenser. Although it is customary to credit the condenser with this amount of work, it should be taken only as an approximation, as it is neither theoretically nor practically correct, because it assumes that if the engine was run non-condensing there would be no back pressure, which is not so, and which in such calculations would so far as it goes, not give the condenser sufficient credit. It is also assumed that the condensation in the cylinder would be the same whether the engine was run condensing or non-condensing, which also is not true, and which would tend to credit the condenser with more than its due. The compression is also different in the two instances, which further complicates the comparison. The only intelligible comparison that can be made is to run the engine with the load in one instance equal to that in the other, which will show exactly the work done by the condenser. 3. How can I find the friction of an engine? *A.*—Take a card while the engine is running without the load; this card will represent the friction of the engine.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

George B. Grant—Gear Wheels. See p. 20.

Link-Belting and Sprocket Wheels.
Send for Catalogue of Link-Belting.
Over 50,000,000 feet of Link-Belt in use.
Link-Belt Engineering Co., Philadelphia and N. Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

N. Y. City Bolt & Nut Co., Limited.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Drop Presses, Punches and Shears. Williams, White & Co., Moline, Ill., manufacturers.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Ice and Refrigerating Machines, 170 sold, and all successful. David Boyle, 521 Monroe St., Chicago, Ill.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N. Y.

Wrist-Pin Machines. Pedrick & Ayer, Philadelphia, Pa.

Horizontal and Radial Drilling Machine. Pedrick & Ayer, Philadelphia, Pa.

Light Special Machinery and Tools to order. The Meriden Machine Tool Co., Meriden, Conn.

$13.00 I. Dea L. Drawing Stands. The original. Send for postal. W. S. Rogers, Troy, N. Y.

Headquarters for Star Hack Saws, Miller's Falls Co., 93 Reade Street, New York.

S. A. Smith, 23 So. Canal St., Chicago, Ill., agent for Appleton Mfg. Co.'s Emery Grinding Machinery.

Grimshaw's Pump Catechism. $1.00 postpaid. Theo. Audel & Co., 91 Liberty St., N. Y. Catalogue.

Audubon Machine Works, New Haven, Conn. Electrical work, superior facilities. Builders of machinery, heavy and light.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the latest improved Eccentric Hook, Connecting Rods and Stub Ends, address T. C. Dill Machine Company, Philadelphia, Pa.

S. W. Card & Co., Mansfield, Mass., make everything in the line of Taps and Dies. S. A. Smith, 23 S. Canal St., Chicago, Western Agent.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

"Twenty Years With the Indicator," by Thomas Pray, Jr. 10,100 sold. Price, $2.50. Order of bookseller; take no other.

Hydraulic Press, Steam Tables, Accumulator Cutting and Stamping Dies, etc. S. Hartley, 245 N. J. R. R. Avenue, Newark, N. J.

Self-adjusting Hand-Screw for Pattern and Cabinet Makers, Wood Workers, etc. Sample by mail for 50 cents. Wm. H. Denney, Lancaster, Pa.

N. Y. City Bolt & Nut Co., Limited, 33 and 35 Desbrosses St., N. Y. City, manufacturers of Machine Bolts of every description. Write for estimates.

Upright Drills and Iron Planers, for immediate delivery; prices reasonable. J. E. Snyder, Worcester, Mass.

25″ 32′ 37″ 42″ "Only Drill Press built on 'Ko-rekt' principles, even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

DuBois & DuBois, Patent Attys., 715 11th St., Washington, D. C., procure first-class patents. Send stamp for illustrated pamphlet, "March of Invention," containing valuable information, and list of references.

Books for Machinists and Engineers. Send for our large Book Catalogue. Just published. It contains works on every practical subject. Norman W. Henley & Co., 150 Nassau Street, N. Y.

Every draftsman needs one. The Engineer's Sketch Book of mechanical movements, appliances, devices, contrivances, etc., by T. W. Barber. 1,936 illustrations, 8vo, cloth, $3. Catalogue of books on mech. subjects free. E. & F. N. Spon, 12 Cortlandt St., New York.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

Club Rates.—If no one is getting up a club for the AMERICAN MACHINIST in your town or establishment, send for Circular of New Club Rates, and try it yourself. Address AMERICAN MACHINIST, 96 Fulton St., New York.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2, postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

MANUFACTURES.

A woolen-mill is to be established at Stockton, Ill.

There is talk of establishing a woolen-mill at North Waldoboro, Me.

An addition to the electric light plant is contemplated at Gainesville, Ga.

J. W. Daniels will put additional machinery in his saw-mill at Gorman, Tenn.

J. A. Stone & Son, wool sorters, Cleveland, Ohio, are to add new machinery soon.

The Arrow Rock Machine Shop Company has been organized at Marshall, Mo.

The Winsted Edge Tool Company, Winsted Conn., is to add new machinery.

T. S. Hardage & Co., of Kensaw, Ga., will add new machinery to their excelsior works.

The Anderson (Ind.) Rolling-mill Company, capital stock $160,000, has been incorporated.

The citizens of Duluth, Minn., are raising a bonus of $125,000 for a steel plant at that place.

The Carrollton Light and Power Company, at Carrollton, Ga., intend enlarging their plant.

An addition will be built this fall to the works of the Athol Machine Company, at Athol, Mass.

The Georgia Manufacturing Co. is to put in new machinery at its cotton-mill at Whitehall, La.

An iron foundry and machine shops are reported as started at Anniston, Ala., by R. J. Saywell.

A St Louis (Mo.) capitalist contemplates establishing an electric light plant in Batesville, Ark.

A new engine and boiler will be added to the plant of the Woolen Company at Kezar Falls, Me.

The McKenny Machine Company, of Baltimore, Md., will start their shop at Sequachee, Tenn., in a few days.

The Alabama Rolling mills, Gate City, will at once rebuild its finishing department, recently burned.

It is stated that a St. Louis (Mo.) party contemplates establishing a cold-storage plant in Huntsville, Ala.

W. T. Evans & Co., Muldon, Miss., are reported as to put new machinery in their grist-mill and cotton gin.

The Maryland Bolt and Nut Company, capitalized at $100,000, have filed articles of incorporation at Baltimore, Md.

The Maist & Gorten Machinery Mfg. Company have been incorporated at Warsaw, Ind., with a capital of $25,000.

The power plant at Nashville, Tenn., is to be generally renovated. The power will be increased to quite an extent.

Fair & Day will, it is stated, put additional machinery in their iron foundry and machine shops at Chattanooga, Tenn.

The business men, of Georgetown, Ky., are organizing a company to introduce electric lighting and power into the town.

Watts Bros. contemplate erecting a Bessemer converter in connection with their present plant at Middlesborough, Ky.

The Vernon Light and Power Company, Tallapoosa, Ga., will, it is stated, double the capacity of its electric light plant.

The Ohio Wheel and Foundry Company have been incorporated at Toledo, Ohio, where operations will be carried on.

It is rumored that a syndicate of Boston capitalists are to establish an electric lighting and railway plant at Dayton, Tenn.

A $300,000 stock company will, it is reported, be organized for the purpose of erecting another cotton-mill in Huntsville, Ala.

The board of park commissioners, Baltimore, Md., contemplate the establishment of an electric light plant in Druid Hill Park.

It is reported that the Cleveland Rolling-mill Company, of Cleveland, Ohio, have completed the plans for a new blast furnace.

The machine shops of G. H. Osbourn, at Clarksburg, W. Va., which were reported last week as burned, will be rebuilt at once.

The board of trade of Rome, Ga., is working for a $500,000 cotton factory which Boston capitalists talk of locating in that section.

A Pittsburgh (Pa.) iron company is investigating with a view of removing its iron works to the vicinity of Gudger's Station, Tenn.

Endeavors are now being made for the organization of a $35,000 to $50,000 stock company, to erect a cotton-yarn mill at Elberton, Ga.

Granger & Jones, Arcadia, Fla., will, it is reported, erect an additional building at their novelty works, and put in new machinery.

An iron bridge, 60 feet wide, is planned to be built over the railroad tracks of the Louisville & Nashville Railroad at Decatur, Ala.

A stock company, of which J. T. Maxon is secretary and treasurer, is to establish an iron foundry and machine shop at Asheboro, N. C.

There is talk of a new iron foundry at Henderson, Me., to make castings required for locomotives and cars on the Canadian Pacific Railroad.

The Alleghany Mining and Development Company are reported to have decided to build a roiling-mill and nail-mill at Clifton Forge, Va.

The commissioners' court of Helena has decided to build an iron and steel bridge over the San Antonio River, opposite Panna Maria, Texas.

Mason, Ford & Company are reported as having bought the $100,000 pump works of the Metcalf Manufacturing Company, at Eddyville, Ky.

The Board of Public Works, Nashville, Tenn has recommended that the city put in its waterworks an additional pump, at a cost of $82,500.

An electric power plant will be established at Lynchburg, Va., to operate the electric railway being constructed by the Rivermont Company.

A movement is on foot at Pulaski City, Va., in which Chicago parties are interested, to establish a galvanized iron works plant; capital, $200,000.

Negotiations are pending for the establishment of a machine shop and an overall factory in Huntington, Ark. A. S. Raymond can give information.

The Thomson-Houston Electric Company, of Boston, Mass., is investigating with a view of erecting an electric light plant in Arkansas City, Ark.

M. H. George, P. G. Bowman and G. R. Harsh, have incorporated the George Car Coupler Company, at Birmingham, Ala., with a capital stock of $250 000.

A third large cotton factory will be built at Huntsville, Ala., and the the present Huntsville cotton factory will double its capacity to 20,000 spindles.

The Southern Steel Company, Birmingham, Ala., held a meeting on July 8th, to consider the increase of its capital stock from $100,000 to $1,000,000.

New machinery, including about 5,000 spindles, is to be placed in the cotton-mill owned by the Lynchburg (Va.) Cotton-mill and Improvement Company.

A joint stock company has been organized at Comanche, Texas, with a capital of $50,000, for a foundry and machine shop, to be erected in the near future.

Northern parties are investigating with a view of establishing in Fernandina, Fla., car wheel works, iron and brass foundry, marine railway and machine shops.

The Columbian Scale Company, of Chicago, has been incorporated, with a capital stock of $200,000. Incorporators are: E. M. Titcomb, G. F. Kimball and M. L. Osgood.

C. H. Tise will establish machine works at Winston, N. C., to manufacture pump well fixtures, etc. Contract has been let for building, three stories high, 30x120 feet.

The Canadian Pacific Railway Company will erect a machine shop at Henderson, Maine, for repairing the rolling stock of the road. An iron foundry is also contemplated.

Frank Congra, of Groton, N. Y., is reported as investigating with a view of purchasing and operating the bridge works of the Decatur Bridge Company, New Decatur, Ala.

The Glasgow Iron Company, of Pottstown, Pa., is about to remove its entire plant to a point in the western part of that town, lying between the Reading and Pennsylvania Railroads.

The La Grange Mills, La Grange, Ga., have, it is stated, received contract for lighting the city, and will at once proceed to improve its electric light plant by the addition of an arc light outfit.

The London Coal and Iron Company, capitalized at $150,000, have filed articles of incorporation in New Jersey. Operations will be carried on at Ducktown, Tenn., and Middlesborough, Ky.

Carnegie, Phipps & Co., of Pittsburgh, Pa., are said to be negotiating for a purchase of the Columbia Iron and Steel Co.'s plant at Uniontown The transaction will represent over $500,000.

The Detroit (Mich.) Combination Tool Company has been incorporated; capital, $25,000; incorporators, A. J. Greene, W. R. Elliott, H. B Elliott, John D. Pigott, Edmund Daniel and Robert Sutherland.

The Thompson Electric Welding Company, of Lynn, Mass., have put in their works a 50-pound Hackney power hammer, fitted with special dies for knocking down burr on pipes and bars after welding.

The J. Morton Poole Company, of Wilmington, Del., is erecting a large addition to its machine shops. The addition is 150x80 feet, built of iron and brick, with a slate roof, and will be practically fire-proof.

The Valley Iron Works, of Williamsport, Pa., is about to remove its entire plant to Lynchburg, Va., where it is erecting extensive works. Hereafter it will be known as the Valley Engine and Machine Company.

C. E. Buck and J. E. Bacon, of Chattanooga, Tenn., and A. B. Peterson, of Chicago, Ill., have recently organized the Frictionless Metal Company and established friction metal works at Chattanooga, Tenn.

There is water-works agitation in Union City, Pa.; Palatka, Fla; Foxboro, Mass.; Reading, Pa; Milan, Texas; Colfax, Wash.; Therold, Ont; New Britain, Conn.; Sheridan, Ill.; Lexington, Va.; West Union, Iowa.

Harry Guenther & Bro. and Mr. Selden have organized, at Owensboro, Ky., the Owensboro Hot Water and Steam Heating Company, and propose to do a general business in hot water and steam heating apparatus.

The National Manufacturing Company has filed articles of incorporation at Seattle, Wash. The capital of the company is $250,000, and its object the manufacture of railroad cars, agricultural and mining machinery.

The W. D. Wood Company, of McKeesport, is erecting another addition to its mammoth works there for the making of sheet-iron. The company uses its own gas for fuel, and will soon have its works in operation.

It is stated that H. L. McKee is negotiating with English capitalists for the establishment of car works in Selma, Ala. It is proposed to organize a $500,000 stock company, operations to begin when $100,000 is subscribed.

The Standard Air-brake Company, of East St, Louis, has been incorporated, with a capital stock of $400,000, for the manufacture of mechanical appliances; incorporators, George E. Paul, Frederick Wesemann and Chas. M. Linhart.

The Enterprise Construction and Supply Company, Limited, has been incorporated at New Orleans, La., for the buying, selling and manufacturing of electrical and other machinery and supplies. The capital stock is $50,000.

A company is about to be formed by Boston capitalists, to push the manufacture and sale of the Emerson car-heating apparatus at Springfield, Mass. The amount of capital stock has not been decided, but will be at least $500,000.

The Goubert Manufacturing Company, 32 Cortlandt street, New York, publish two illustrated circulars, one on the use of feed-water heaters, the other as to means to be employed in furnishing dry steam to an engine or for other purposes.

L. S. Bent, F. W. Wood, E. C. Felton and others have incorporated at Sparrow's Point, Md., to be Maryland Steel Company, of Baltimore County, to manufacture iron and steel, build ships, develop mineral deposits, etc. The capital stock is $1,000,000.

A company has been formed at New Albany, Ind., with sufficient capital for operating the steam forge and rolling-mill which recently suspended operations at that point. It is said that work will be commenced at once on a much larger scale than heretofore.

The Southern Electric Company has been incorporated at Lynchburg, Va., with C. P. Poole, president, and C. W. Poole, vice president, for the purpose of manufacturing electrical apparatus. The capital stock is to be not less than $5,000, nor more than $25,000.

The Swett Car Wheel and Foundry Company has been organized at Saco, Me., for the purpose of manufacturing car wheels, etc. The company has a capital of $250,000, and its officers are: President, George W. Swett, of Troy, N. Y.; treasurer, Fred. W. Swett, of Troy, N. Y.

The proposition of Dr. Charles J. Eames, of Pittsburgh, to build an iron and steel plant on San Diego Bay, near San Diego, Cal., of 100 tons daily capacity, for a subsidy of $200,000 in cash and land, has been accepted by the Chamber of Commerce of that city, and a committee appointed to perfect the plans.

Over $100,000 has been subscribed to the stock of the newly organized Atlanta Iron and Steel Casting Company, and the erection of a foundry at Atlanta, Ga., will begin about July 1st. The company propose to manufacture malleable iron castings of all kinds, and convert them into steel by the Bates process.

The Denver Steel Company is preparing to erect its plant. The company has closed contracts for the control and operation of several sections of iron and coal lands, principally in the southwestern part of the State, in the Gunnison country. It is announced that some good Bessemer ore has been discovered.

The East Lebanon Iron Company has been formed at East Lebanon, Pa., to erect a rolling-mill at that place. The capital of the company is $100,000. N. E. Legat is president, and the remainder of the directory is composed of H. O. Nully, James E. Legat, J. R. Beckley, Daniel S. Light, J. B. Irish and H. T. Atkins.

The establishment of car works at Beaumont, Texas, has been definitely decided upon. The citizens have guaranteed a bonus of $50,000 and the plant will be built at once. The capitalists that are behind the project are said to have paid up capital stock of half a million. Five hundred men will be employed.

The Frank Woodman Machine Works, of Charleston, and the Lucadoe & Jager Foundry, of Elk City, have been consolidated, and will be located at Elk City, W. Va. The new concern will occupy a piece of ground donated by the Elk City Improvement Company, and will manufacture coal and other light cars.

The Springfield Car and Foundry Company, Springfield, Mo., whose works were destroyed by fire on April 18th, have already rebuilt almost their entire plant, on a much larger and more substantial scale than before, and now have one of the most complete and well equipped shops in the West. Their molding-room is 75x176 feet.

The New Home Sewing Machine Company, at Orange, Mass., are to erect at once a four-story brick building, 250x50; a two-story brick building, 106x50; and a brick office, 60x50; also an addition, 40x35, to their stable. Their seven water wheels will be increased to eight. The old dam on the Millers' River will be blown out, and a new dam built.

The Middleton Car Spring Company, of Philadelphia, is soon to remove its plant to Harvey, Ill., near Chicago, and will occupy a tract of eight acres north of 155th street. This company has a capital stock of $100,000. The officers are: William J. Watson, president; Nathan Middleton, of Philadelphia, vice-president, and James B. Quirk, secretary and treasurer.

The Botsford Steam Car Heating Company will soon complete the removal of its works to South Akron, O. The plant is to consist of two buildings, one a brick structure 100x300, two stories high, and a frame building 46x60. The company will manufacture brass goods, car heating appliances, boilers for house-heating purposes, railroad cattle guards, railroad and gray iron castings.

The Toronto and Nebraska barb wire concerns have consolidated, with a capital stock of $200,000, and will establish a plant in Denver. The consolidation is styled the Colorado Barb Wire Manufacturing Company, and will shortly begin operations. Seven buildings will be erected, at a cost of about $60,000, and it is expected that before the first of August the machinery will be in operation.

A company has been organized in Pittsburgh, Pa., for the manufacture of razors, surgical instruments and high grade edge tools generally. The incorporators are A. H. Church, R. D. Nuttle, John T. Wheeler, J. G. Ihmsen and H. Watts, and the concern will be known as the Sterling Razor Company. They say they can get steel in Pittsburgh good enough for any purpose to which it is at present put.

The Kingsley Foundry Company, of Lorraine, Ohio, have commenced building operations upon their 20-acre purchase at Hammond, Ind. Five structures will be put up, at a cost of $100,000, work on the foundations of the main building, to be 200x85 feet, being now in progress. Besides this building there will be a boiler, engine, pattern-making room, and office buildings. All the buildings will be of brick.

Beaman & Smith, Providence, R. I., designers and builders of machinery and tools, have recently issued a very neat illustrated catalogue showing in part the tools—lathes, milling machines, etc.—that they manufacture. In addition to cuts and description of machines, the catalogue contains a table of cutting speeds, horse-power of belts, and a formula for cutter lubricant. The catalogue is the first issued by this company, and is of the kind likely to be preserved.

The Muskegon Car Company, of Muskegon, Mich., which closed its works some three months ago, has been reorganized by the creditors, under the name of the West Michigan Car and Machine Company, with a capital stock of $250,000, of which $125,000 is taken by the creditors and $50,000 by the Chicago & West Michigan road. The directors are: C. M. Heald, of Grand Rapids; S. A. Fuller, of Cleveland; C. H. Hackley, H. Park, L. Kanitz, J. J. Howder, and W. S. Wood, of Muskegon.

New Castle, Pa., is to have a new steel plant. Capital stock to the amount of $265,000 has been subscribed, and the final arrangements for starting the erection of the mills are now being made. It will have a capacity of 400 tons of steel per day, and will employ between 200 and 300 men. One-half of the product of the new plant, it is said, will be consumed by the rod-mill at New Castle, and the pig-iron to be used will be produced by the furnace at the same place. Operations will begin early in July for erection of the plant. It is said that at first two 5-ton converters will be erected.

The Watts-Campbell Company, Newark, N. J., appear to be going right along increasing their facilities for doing work by the addition of buildings and tools. Those who remember these works a few years ago would find but little now to remind them of the old shops. The steam engine work of the firm has tended largely of late to compound engines. Still we noticed in a recent visit to the works that they are filling orders for a good many simple engines, mostly in the smaller sizes, the largest, as we remember, being a 20″x48″, and the smallest a 75 horse-power. In compounds we noted a 26″ and 48″, stroke 72″, cross compound; a pair twin tandem compounds, 22″ and 40″, stroke 60″; a pair of cross compounds, 24″ and 44″, stroke 48″; a pair of 20″ and 36″, stroke 48″, cross compounds; a pair twin tandems, 18″x32″, stroke 48″; a 16″ and 29″, stroke 42″, tandem compound. For one of these engines they are making a band wheel 28 feet diameter, 90″ face, turned for three belts.

The Brown & Sharpe Manufacturing Company, of Providence, R. I., issue the following, addressed to their patrons:

Our works will be closed from August 3 to 15, inclusive, for annual vacation and repairs. Please bear this in mind in connection with any orders you have in contemplation. The office will be kept open as usual, and all orders will be promptly filled for machinery or tools described in our catalogue, and usually kept in stock.

It has always appeared to us that mechanics who work regularly through the year stand in need of a short summer vacation quite as much as any class of workers. And it appears that the plan adopted by the above-named firm to see that they get it is a very sensible one; probably on the whole best for the men and best for the company. There are, of course, some establishments where the character of the work will not admit of this, but the plan might be followed much more generally than it is, to the benefit of all.

Mr. Charles H. Cramp is authority for the statement that it is entirely out of the question for an American shipbuilder to duplicate exactly a British ship or to follow out British specifications and plans, because American vessels are in advance, and there is no comparison when the outfit of the vessel is considered. Another point he makes is the fact that when foreign shipbuilders are asked to duplicate an American ship, or build entirely on American plans or methods, they always ask as much as American builders. This has been confirmed by evidence furnished by Mr. Cramp, and the whole summing up means that a contract for an inferior vessel will not be undertaken here on competitive terms, but that our shipbuilders stand ready to duplicate first-class steamers at the same cost of construction as abroad.—*Marine Journal.*

Dr. Hermann Wedding, a German authority, estimates that the total production of finished iron in the world in 1888 was 18,652,000 tons, in the production of which 23,550,000 tons of pig iron were consumed.

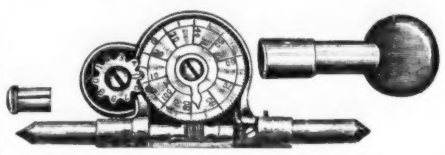
Models for Drawing.

Teachers of mechanical drawing often find it to be a difficult matter to impress upon the minds of young learners the principle involved in making a working drawing. At least two views, and frequently more than two of an object are required to show its whole form; and to make the drawing intelligible the different views should not be placed haphazard anywhere on the paper, but they should have correct relative positions to each other. The outlines of objects and the position of the different views are governed by well-defined principles, and if these are thoroughly understood there should not be any hinderance to a rapid progress in the study of mechanical drawing. But frequently the most elementary principles, although very easily understood by the advanced student, prove to be a stumbling-block to young learners. Mr. N. O. Starks, superintendent of the Fuller & Johnson Works, Madison, Wis., has devised a system of models which are admirably adapted for the use of beginners, and will aid them to grasp those principles of which a thorough knowledge is so essential at the commencement of the study. All the models of this system are constructed on the same principle, and the illustration here given of one of the models will be sufficient to obtain a fair idea of the construction of all. This model simply consists of a box, with the objects *A*, *B*, *C*, *D*, of which drawings are to be made, fastened to the inner face of one of the sides. The upper side and one of the vertical sides of the box are made to slide out. Fig. 1 shows a plan of the box with the upper side partly moved out; and Fig. 2 shows the elevation of the box with the vertical side partly opened, thereby exposing to view the blocks *A*, *B*, *C*, and *D*. The figures A_2, B_2, C_2, D_2 drawn on the lid represent the plans of the blocks, just as they should be drawn on a regular working drawing; and the figures A_3, B_3, C_3 and D_3 drawn on movable side *F* represent the elevations of the same blocks. When these sides are closed the figures A_2, B_2, C_2, D_2 will be directly over the blocks; and the figures A_3, B_3, C_3, D_3 will be directly in front of them. The principles which this model is intended to convey may be briefly stated in the following order: First: To make a working drawing it may be assumed that the movable sides are transparent; then, to obtain the outlines which make up the drawing, the edges of the blocks are traced on these sides of the box, just as we would do in making a tracing of a drawing. Although this is not a very elegant way of expressing the underlying principle of all mechanical drawings, the beginner will probably get a better idea from this expression than from one expressed in geometrical language. Second: This model also shows that one view must be directly over the other; for instance, the plan *a b c d* of the block *D* must be either directly over or under the elevation *g h i j*. Lastly: It will be noticed that the plans on the lid *E* are alike, therefore the plans without the elevations do not show the complete forms of the blocks. On the other hand, the plans and the elevations combined give the complete forms of all the blocks. Here, then, we see that at least two views of an object are necessary to show its whole form.

Experience has shown that, with the aid of these models, shop boys or apprentices have made rapid progress; and undoubtedly this system may be employed with equal advantage in schools or anywhere else where the rudiments of mechanical drawing are taught.

Mr. Starks has not yet offered these models for sale, but he will of course do so if there is a demand for them. He will also take pleasure in answering any question in regard to this system.

Bids were opened recently by the Navy Department for two forty-ton traveling cranes to be used at the Brooklyn and Norfolk Navy Yards. There were six bidders, three of these bidding on the Government design, while the other three bids were upon modifications of this design. Among the latter were William Sellers & Co., whose bid was considerably below any other, and they will probably receive the contract if their modifications of the design and specifications are approved.



Church's Double-Speed Indicator.

The accompanying illustration shows a speed indicator which in principle is the same as those which have been in use for some time, but, unlike them, it is made double-ended, the object of this being that, no matter in which direction the shaft may be running—whether to the right or left—the graduations on the revolving wheels are made to read right by simply choosing and applying the proper end of the instrument. It will be noticed that there are two points on the worm spindle, either one of which may be covered by the thumb-piece shown while the other is in use, and thus the counter is either right or left hand, as may be desired.

In addition to the worm wheel which records up to 100 revolutions, there is a smaller wheel, which has ten notches, one of these being moved at each revolution of the larger wheel. The revolutions of the larger wheels are thus recorded up to 10, or 1,000 revolutions of the shaft. Both points are covered when the tool is not in use. It is being introduced by Church & Sleight, 109 Fulton street, New York.

The general executive board of the Knights of Labor has fixed upon Toledo, Ohio, as the next meeting place for the general assembly.

An Opportunity that Should be Taken Advantage Of.

We learn that the class in steam engineering for the term 1891–92, in the Young Men's Institute, 222–224 Bowery, will begin work on the evening of Wednesday, September 30, continuing up to the evening of Wednesday, April 27, 1892. This class will, as for two or three years past, be under the supervision of Mr. William H. Weightman, and we need hardly say that under his care the work will be well done. We are willing to go out of our way a little in advising steam engineers in New York and vicinity to attend this course. It is an almost free course, embracing in the way of instruction all the efforts of a thoroughly practical man, who, at the same time, keeps abreast of what others know and do in the direction of subjects relating to the course. Any desired information can be had from the Institute, or from William H. Weightman, Columbia building, Broadway, N. Y. There is no time to spare in making the necessary arrangements for this course, and as we have previously intimated, every steam engineer—young or old—should look at the advisability of taking part. While, as we have said, the cost is merely nominal, it is not a matter of charity; and any engineer who attends this course may feel assured that he is paying for what he gets, although the price is mighty small.

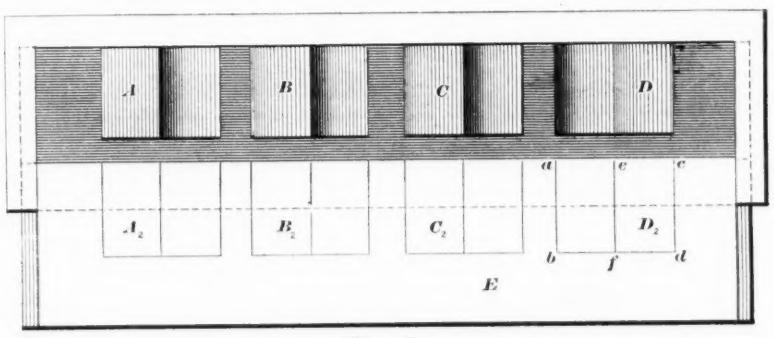


Fig. 1.

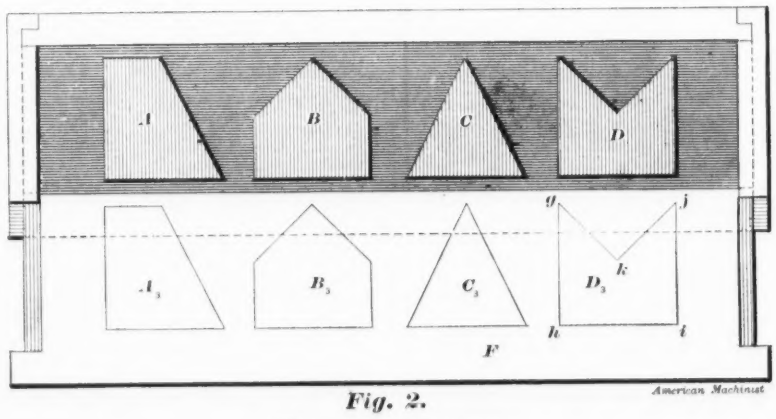


Fig. 2.

MODELS FOR DRAWING.

Considerable excitement is caused by the belief that the Western farmers have determined to lock up the year's wheat crop for exorbitant prices. After all, considering the present practice of the country, who can find fault if the farmers do take this course?

How men can sometimes sustain a shock that, according to all precedent, ought to kill them instantly, was recently exemplified in the instance of a carpenter who fell from a height of five stories at Watertown, N. Y., and sustained no serious injuries.

The Cunard steamer "Servia," which sailed from this port July 4, broke her high-pressure crank-pin when a short distance from port, and had to be towed back until repairs are made. As is the case with all accidents to passenger steamers, this one caused considerable excitement among the passengers and their friends, though there was at no time any danger to speak of.

The accident has given an opportunity to the daily newspaper reporter to show his usual knowledge of such matters, one of them announcing that "the crank-pin is broken clean off at one side of the piston rod, and partially at the other side, but springs back into position with the force of the steel that it is made of, so that it remains in position." The writer of that gem is probably a college graduate, and quite a smart fellow in his way: he is not to blame particularly for not knowing that crank-pins cannot break off nor do anything else "at the side of the piston rod," but he should know that there is no such thing as the "force of steel."

There is some cause for wonderment that the great daily papers, which do not stop for expense in most directions, will allow themselves to be made ridiculous every time an attempt is made to give an account of an event in which machinery is concerned. It would seem to be an easy matter to secure men knowing enough of mechanics to revise matter pertaining to machinery, so that it would be intelligible, instead of simply ridiculous.

A Protest.

We have received the following from Omaha, Neb. In reference to it we can only say that, in our opinion, no eastern member of the association ever had a doubt that the Omaha members would do everything that both justice and generosity dictated in the matter referred to. Eastern men have seen too much of the great way in which western men do these things ever to have had a suspicion of doubt in the matter:

To the Members and Friends of the N. A. S. E.:

Whereas, The National Association of Stationary Engineers, at their ninth annual convention in New York, September, 1891, selected the city of Omaha as a place for holding their tenth annual convention; and

Whereas, At that time our delegates pledged us and themselves that Omaha No. 1, N. A. S. E., would see to it that the delegates and members' would be fraternally welcomed and cared for; and

Whereas, It has come to our knowledge that certain parties, evidently enemies of the N. A. S. E. and the city of Omaha, have in underhanded ways sought to convey the impression that the Omaha convention would be a failure, through our inability to fulfill our pledges; therefore be it

Resolved, That we, through the press, convey to our brethren of the N. A. S. E., and all interested, the assurance that the reports thus circulated are in every way false. That Omaha No. 1, N. A. S. E., has made all necessary arrangements, pecuniary and otherwise, and is fully prepared to carry out to the letter, and in a manner alike creditable to the association, the city of Omaha and the West, the pledges made in New York. And we request all concerned to give no heed to the assertions of unprincipled and irresponsible parties, who, for obvious reasons, lend themselves to misrepresentation and deceit.

(Signed) W. B. AUSTIN,
JOE A. WELZENBACH,
W. B. STARK,
N. GEO. BRUSH,
J. W. MATTHEWS, Sec.,
Committee of Arrangements.

OMAHA, Neb., July 1st, 1891.

Notwithstanding that the Nicaragua Canal ought by all means to be an American enterprise, it seems doubtful if the money to build it can be raised in this country. This money is not forthcoming, and it looks now as if English capital would furnish the means for doing the work. The stock will be watered, of course, and in the end those who use the canal will pay from two to three times as much for the privilege as they ought to pay.

Now it is believed that the Egyptians employed means for transporting ships over land 2,300 years ago; that is, they had ship railways, the tracks of which were made of polished granite.

It is suggested by an English engineer that engineering firms that are invited to put in tenders for work be paid for doing so, the firm receiving the order to deduct the sum paid for the tender.

Machinists' Supplies and Iron.

NEW YORK, July 11, 1891.

Iron—American Pig—A fair degree of activity pervades the market, and prices are well maintained.

We quote: No. 1 Foundry, Standard Northern brands, $16 50 to $18; No. 2 is selling at $16 to $17, and Gray Forge at $13.90 to $14.50. Southern brands of good quality are obtainable at $16 to $17.50 for No. 1 Foundry; and $15.75 to $16 for No. 2; and $14 to $14.50 for No. 3.

Scotch Pig—We quote at $24.50 for Coltness; $22 for Dalmellington; and $20.50 for Eglington.

Copper—Very little is being done in Lake, and the prices are considered nominal. The outside figure is 13c. Arizona Ingot, 12¼c. to 13c. Casting copper is steady at 12c. to 12¼c.

Lead—Not much is being done, for the reason that there is a failure to agree upon prices, holders seeming disposed to firmly maintain them. Values are at about 4.50c. to 4.55c., according to the quantity.

Spelter—The market is still dull, there being no change in the situation worthy of note. Values are at 5c. to 5.10c.

Tin—The recent advance has been maintained, and values here are at 20.35c. to 20.40c.

Antimony—The market is steady.

We quote Hallett's at 12c. to 12½c.; Cookson's, 14c. to 14¼c.; and 13c. for L. X.

Lard Oil—Prices are maintained at 52c. to 53c. for City. Western at 51c.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 80 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

All round young machinist; aged 21 years, desires change; will go anywhere. Fulton, AM. MACH.

Wanted—Two first-class die sinkers, steady employment. Ottumwa Iron Works, Ottumwa, Iowa.

Wanted—First-class mechanical draftsman; state experience, and wages expected. Springfield Emery Wheel Mfg. Co., Bridgeport, Conn.

Place wanted as superintendent or assistant; experience, designing and building special and regular machine tools. Address A. T. O., AM. MACH.

Wanted—Opening by young man (25), college graduate, one year machine shop, one year draftsman. Address Ford, AMERICAN MACHINIST.

Mechanical engineer and designer wants position of responsibility; extended general exp. in designing mach'y.; best refs. Box 15, AM. MACHINIST.

Sit. wanted as foreman; all-round exp.; blacksmith line, hammer & drop; also presses, die-hardening, &c.; good ref. J. L. R., Hartford, Conn.

Wanted—Three pattern makers; those experienced on pump or engine work preferred. Deane Steam Pump Company, Holyoke, Mass.

Wanted—A good mechanical engineer in a large manufacturing establishment. Address, with references, Post Office Box 1582, Philadelphia.

Wanted—A first-class all-round mechanic; one who understands mill machinery pref. State wages, references, experience. Steady, P. O. Box 672, N. Y.

Millwright and engineer desires position in mill or factory; age 37; 15 years experience, 6 years as foreman. Brooklyn, AMERICAN MACHINIST.

Wanted—First-class machinist with some money to take charge of new plant in East Tenn. Address Box 346, Bristol, Tenn.

Wanted—A first-class shuttle and attachment maker. Address Noble Sewing Machine and Manufacturing Co., Weeping Water, Neb.

Wanted—Preferably in or near N. Y. City, situation as mechanical draftsman; has had large exp. in pattern shop and drafting-room; age 40; A 1 references. Practical, AMERICAN MACHINIST.

Wanted—To correspond with parties in need of a practical millwright and erecting engineer, or will take charge of a good steam plant; well up in steam machinery; Va. or Tenn. preferred; age 30, married; best refs. Hustler, AMERICAN MACHINIST.

Wanted—A sober, energetic young man, good engineer and machinist, who can operate a Miller & Bierce steam and hydraulic cotton compress successfully; also take charge of labor around the compress, commencing August 15th inst.; salary $75 per month. Address, with references, Union Compress & Warehouse Co., Macon, Ga.

Wanted—At Pittsburgh Locomotive Works, Pittsburgh, Pa., a competent foundryman to take charge of iron and brass foundries; must be active, entirely temperate, and thoroughly understand locomotive work; state salary expected, and give references.

Wanted—A thoroughly competent man for superintendent of a manufacturing concern (in the West) doing a general foundry and machine business, and employing 100 men; must be a good foundryman, and well up in construction of machinery, with ability to manage men; a good position to right man. Address D. K., AMERICAN MACHINIST.

A mechanical engineer, now holding responsible position in a large manufacturing concern, desires to make a change; experienced in modern economical methods of manufacture, and especially so in producing machinery and its products in quantities, where jigs and duplicating machinery is required; also in the erection and testing of steam plants, and in operating them to their highest economy, and in the manufacture of wire and wire-working machinery; will be pleased to correspond with any party having a responsible position open who requires the services of a competent, energetic man. Address A. S. M. E., care AM. MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Cheap 2d hd-lathes & planers. S. M. York, Clev'd, O.

Best Steel Flue Scrapers. Kelley Co., Erie, Pa.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Special leather and cement for covering pulleys; no rivets required; local agents wanted. Crescent Mfg. Company, Cleveland, Ohio.

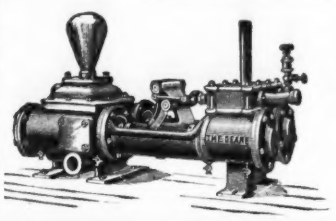
Engine for sale; 55 H. P. Watts-Campbell slide valve engine in good order; will be sold cheap. F. Berg & Co., Orange Valley, N. J.

One Wright automatic engine for sale, in good condition; cylinders 15"x32". Can be seen at 251 Greenpoint avenue, Brooklyn.

For Sale—Three 3-ton jib cranes. 20 ft. height of mast, swing in space of 35 ft. Can be seen in position until July 15th at works of The J. Morton Poole Co., Wilmington, Del.

Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent. Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.

Wanted—An agent in every shop for the Machinist's Hand Book of Practical Rules and Shop Kinks; containing all the rules on screw cutting, figuring speed; a treatise on steam engines, etc. Sample copy 50c., leather binding 75c. Address Loetzer & Bynon, Sayre, Pa.



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DEANE STEAM PUMP CO.,
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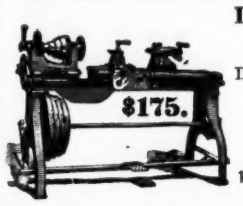
TOOL & DIE STEEL
of Uniform Quality and Great Strength.



Improved Screw Cutting Foot and Power. LATHES
Drill Presses, Shapers, Band, Circular and Scroll Saws. Machinists' Tools and Supplies. Lathes on trial. Catalogue mailed on application.
THE SEBASTIAN-MAY CO.,
167 to 175 Highland Avenue, SIDNEY, OHIO.
MONTGOMERY & CO., 105 Fulton St., New York, Gen'l Agents.

FINE TAPS, DIES, REAMERS, ETC.,
LIGHTNING AND GREEN RIVER SCREW PLATES.

Bolt Cutters, Hand and Power Drilling Machines, Punching Presses, Tire Benders, Tire Upsetters and Other Labor-saving Tools. Send for Price List.
WILEY & RUSSELL MFG. CO., Greenfield, Mass. New York Agency, 126 Liberty St.

PRACTICALLY DEMONSTRATED.
THE HACKNEY POWER HAMMER
is meeting with DESERVED SUCCESS, and an investigation as to its principle of operation and construction will convince any one beyond question of its superiority in every respect over the old fashioned-helve-rubber cushioned-leather strap-awkward belt tightener power hammers sold to-day. All such old fogy and frail appliances are done away with in the "HACKNEY," and the purchaser gets for his money a vastly more EFFECTIVE and DURABLE HAMMER.
That the "HACKNEY" is far ahead of any other power hammer in the market is PRACTICALLY DEMONSTRATED, and we have strong testimonial letters from leading firms throughout the country who have used them.
Write for Illustrated Catalogue with Description and Prices.
THE HACKNEY HAMMER COMPANY, Cleveland, Ohio.

The Bradley Cushioned Hammers
Never Questioned.
The superiority of the Bradley Hammers has never been questioned. Some think the price is a little high, but no other manufacturer furnishes as much. Anvil block made separate, not cast in one piece with the main frame. Wide eccentric and strap, not a little crank pin. Slip sleeve for instantly changing length of stroke. Rubber cushions to absorb the concussion. Helve, Upright and Beaudry styles. Send for catalogue.
BRADLEY & CO., SYRACUSE, N. Y. Branches at 14 Warren St., N. Y., and 96 & 98 Sudbury St., Boston.

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For TOOLS, DRILLS, DIES, &C.
All Kinds in Stock.
Gold Medal, Paris, 1889.
MANUFACTORY,
WILLIAM JESSOP & SONS, LD. | SHEFFIELD, ENGLAND. | Chief American Office, 91 JOHN ST., NEW YORK.

STEEL TUBES
WELDLESS
SMOOTH · COLD DRAWN
John S. Leng's Son & Co. New York.

BOOKS FOR MOULDERS,
West's American Foundry Practice, $2.50
West's Moulder's Text-Book, - - - 2.50
Mailed and prepaid on receipt of price.
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STANDARD OIL CUPS.
FOR ENGINES & DYNAMOS.

HIGH SPEED MACHINERY.
A. J. WILKINSON & CO.,
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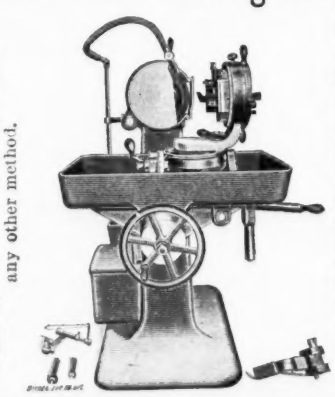
Machinists' Tools
AND SUPPLIES.
105 Fulton Street,
NEW YORK CITY.

Universal Tool Grinding Machine.



Lathe and Planer Tools can be ground on this Machine, better and cheaper, than by any other method.
We also build a large line of improved Duplex Turret Lathes, Screw Machines, special Turret Machines for finishing Motor Gears, etc. Send for Catalogue and Prices.
GISHOLT MACHINE CO., Madison, Wis.

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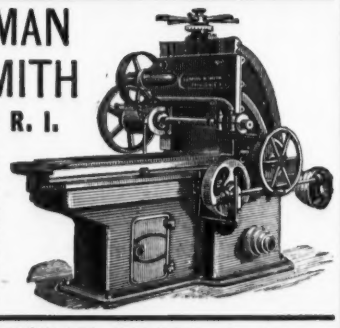

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We are prepared to take Contracts for applying Steam Pipe and Boiler Coverings in any part of the United States.
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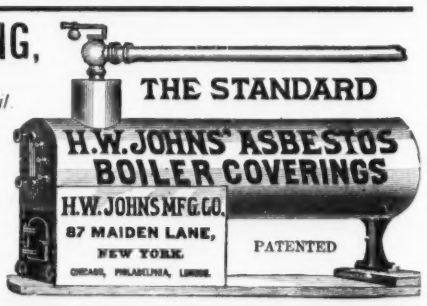

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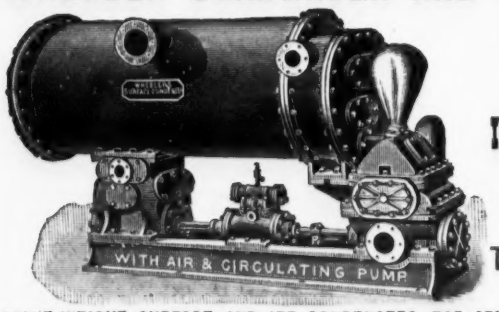

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Improved Patent Surface Condensers,
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With Patent Waterproof Packing.
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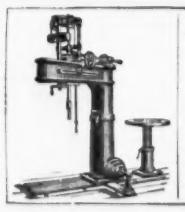

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FILES AND RASPS
FOR EVERY VARIETY OF WORK.

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Office and Works: East Berlin, Conn.

The illustration shown above is taken direct from a photograph showing the interior of an iron foundry designed and built by us for The Farrel Foundry & Machine Co., at Ansonia, Conn. The building is 120 ft. in width by 301 ft. in length. The central portion being 56 ft. wide, served by two hydraulic traveling cranes of 50 tons capacity. This is probably the best and most complete foundry for heavy castings to be found in the United States.

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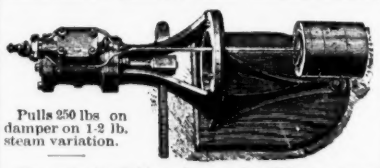
Write for latest Circular. **W. H. NICHOLSON & CO., Wilkes-Barre, Pa.**

C. H. DE LAMATER & CO.,
FOOT WEST 13TH STREET, N. Y.,

Offer remaining tools at the following prices:

1 De Lamater Horizontal Boring Mill, 62" swing, 18' bed, and with three boring bars, $700.
1 No. 2 Silsby Rotary Pump, - - - - 20.
1 25-ton Traveling Crane, 20', 9½" span, - 1,200.
1 25-ton Traveling Crane, 40' span, - - 900.
1 18-ton Traveling Crane, 40' span, - - - 700.
Lot steel tools for Lathes and Planers. Your choice at 10 cents per lb., or the lot at less price.
1 36" Dimpfel Blower, - - - - - - 20.
1 45" Dimpfel Blower, - - - - - - 25.
1 No. 6 Sturtevant Blower, - - - - - 30.
1 700-lb. Binary Ice Machine, with boiler, pipes, etc.
2 700-lb. Binary Ice Machines, to run with belt.
Lot Propeller Wheels, from 22" to 8' 8" diameter, at half price.
An assortment of Steam Pumps at very low price.

BLAKE DAMPER REGULATOR.



Pulls 250 lbs on damper on 1-2 lb. steam variation.

Trial allowed. Correspondence invited.

Guaranteed reliable and accurate within one pound variation. Has differential motion. No Diaphragm. Nickel Plated. Prices right. JOHN H. BLAKE, 136 Liberty St., New York.

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How to get the best results with "R. MUSHET'S SPECIAL STEEL." Greatly increase your speeds and feeds then compare the work you turn off with that done by any other known Steel. This will make the first cost of "Mushet's" look insignificant.

B. M. JONES & CO.,
Sole Representatives in the United States.
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THE "DODGE INDEPENDENCE"
WOOD SPLIT PULLEY
LEADS ALL OTHERS.

Combines LIGHTNESS with GREAT STRENGTH, CHEAPNESS and GREATEST EFFICIENCY.

Can be put on without disturbing the shaft and with the bushings will fit various sizes of shafts 6" to 60" diameter in stock.

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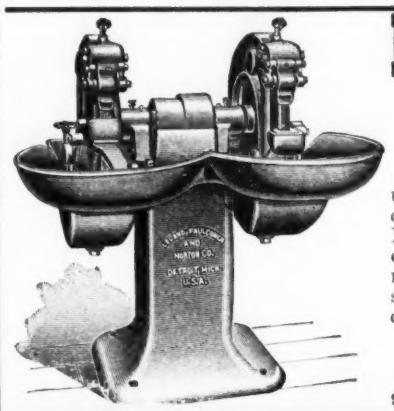
REDUCED PRICES OF

LECOUNT'S LIGHT STEEL DOG.

No.	INCH.	PRICE.	No.	INCH.	PRICE.
1	3/8	$ .35	8	2	$1.10
2	1/2	.35	Small Set of 8—5.50		
3	3/4	.50	9	2½	1.40
4	1	.60	10	3	1.50
5	1¼	.75	11	3½	1.70
6	1½	.85	12	4	1.90
7	1¾	1.00	Full Set of 12—12.00		

C. W. LeCOUNT, South Norwalk, Conn.
These goods are for sale by CHAS. CHURCHILL & CO., L'd, 21 Cross St., London, England.



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WET EMERY GRINDER.

Any amount of water easily applied without the use of Pump, Hose, Treadles, Cocks, or any of the objectionable features common in this class of Machine. Truing Device, which is inexpensive, does the work perfectly and quickly. The whole rig practically as simple as the old-fashioned grindstone trough and much more effective. Send for circular.

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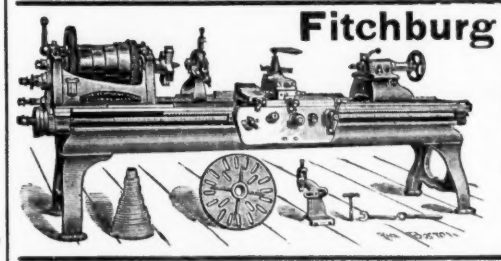

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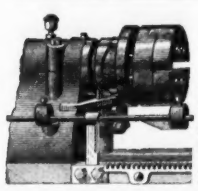
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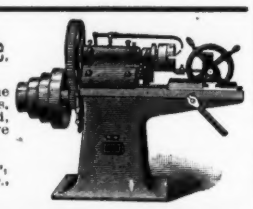

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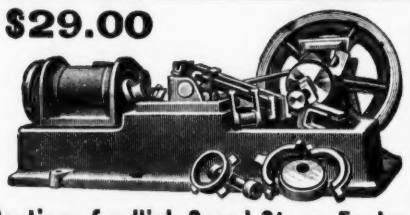
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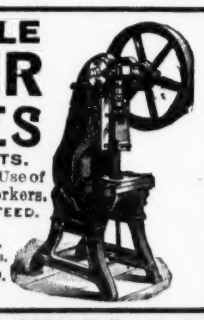

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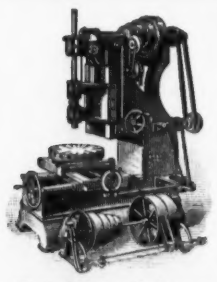
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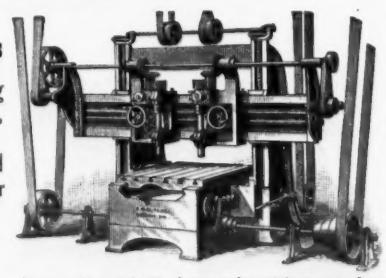
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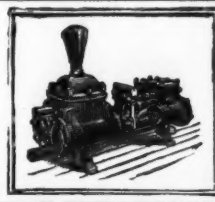
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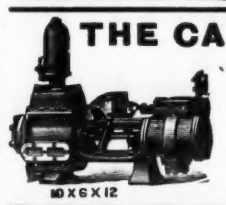
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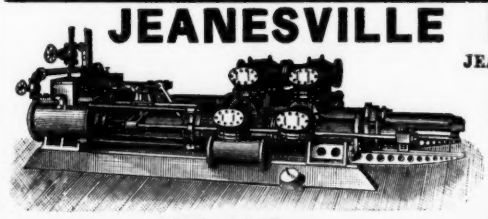
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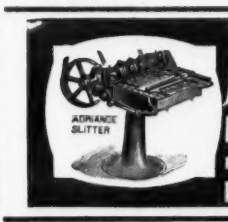

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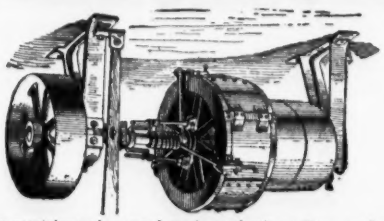
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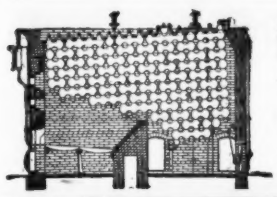

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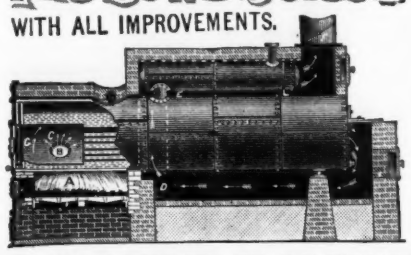

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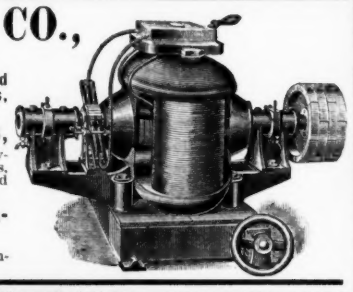

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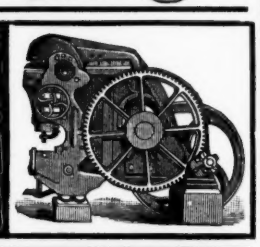

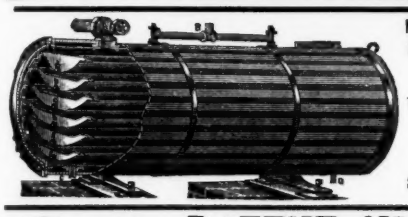

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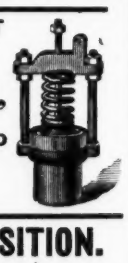

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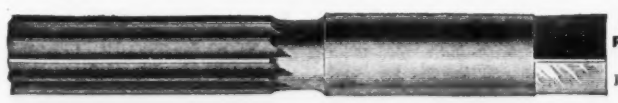

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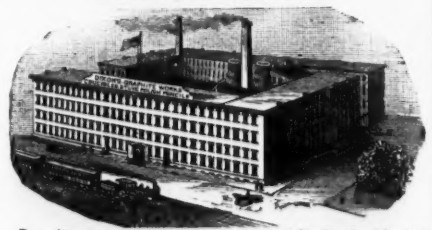

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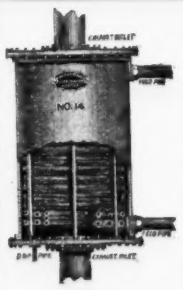

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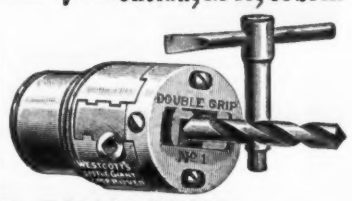

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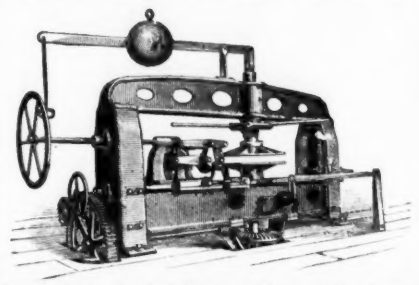

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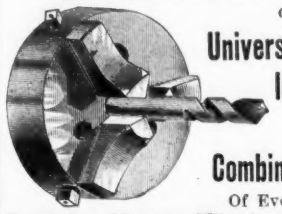

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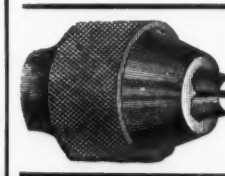

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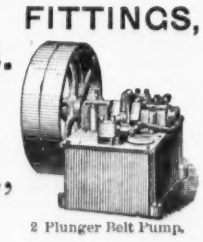

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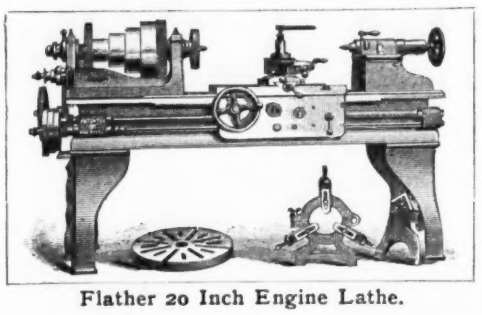

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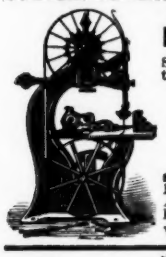

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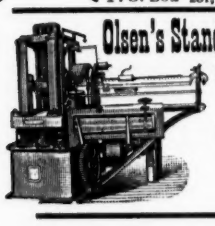

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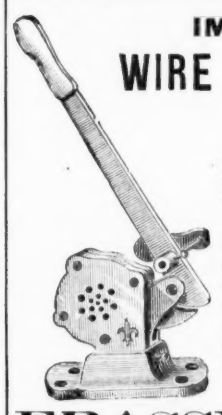

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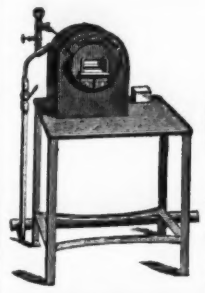

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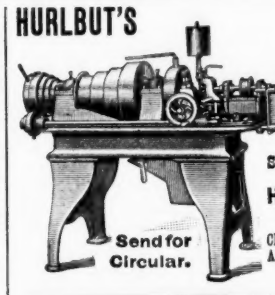

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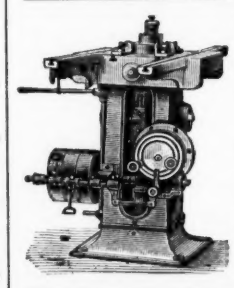

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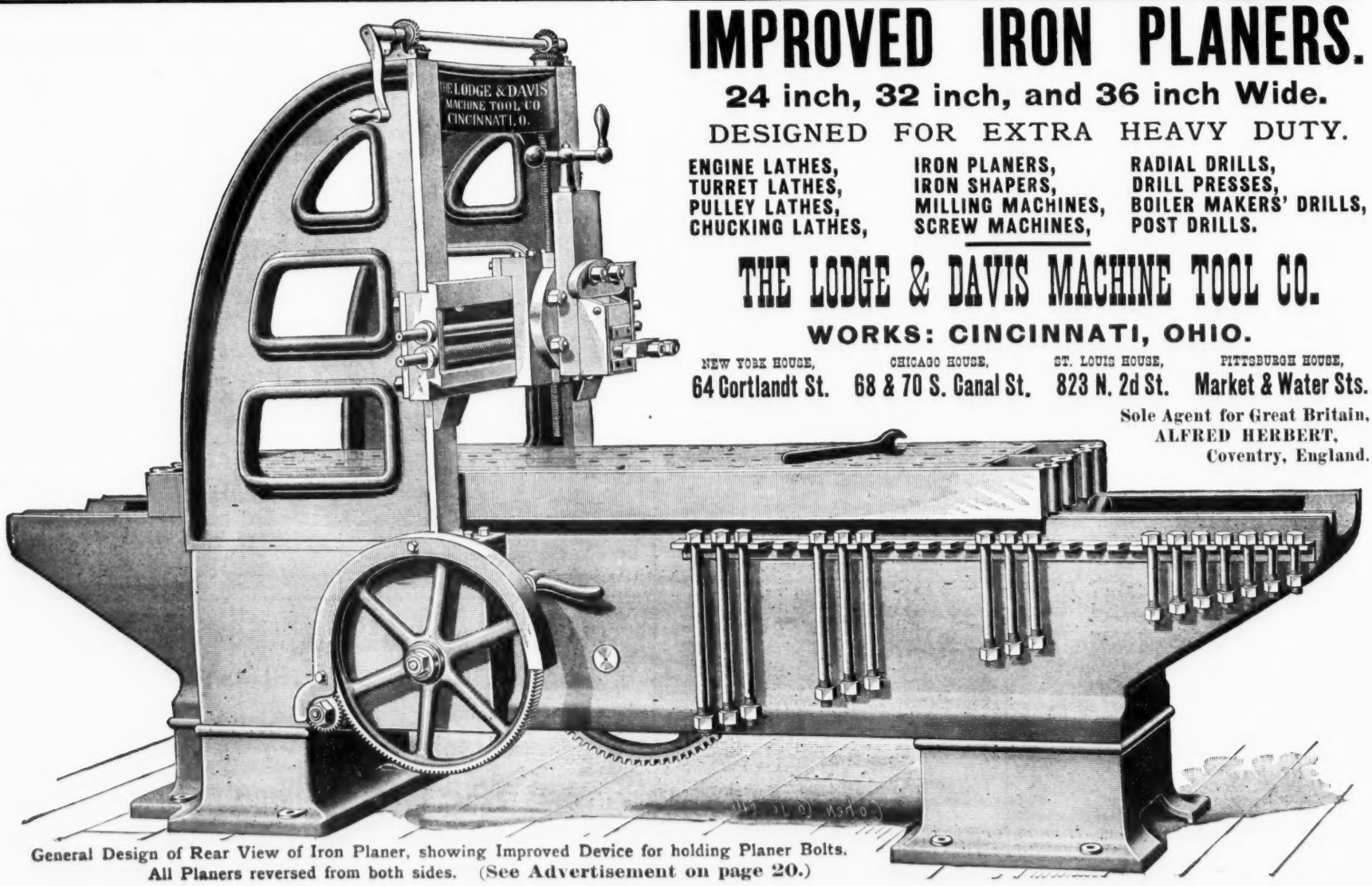

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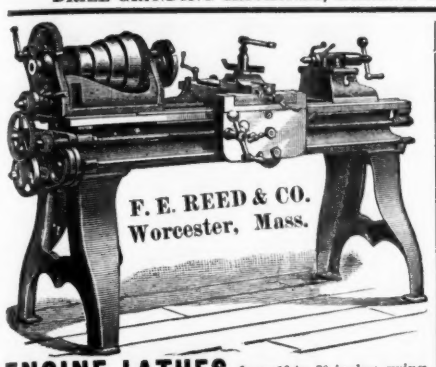

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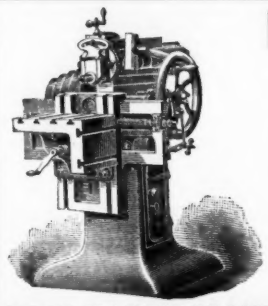

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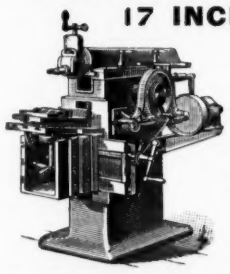

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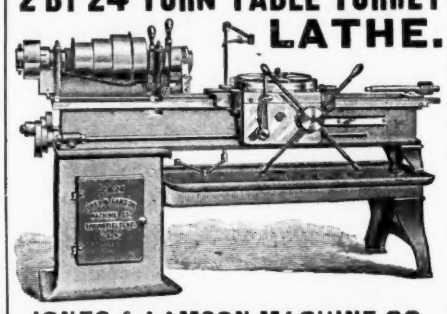

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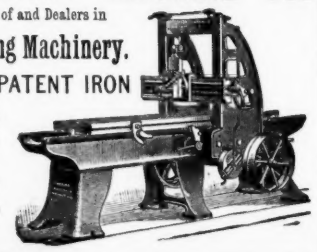

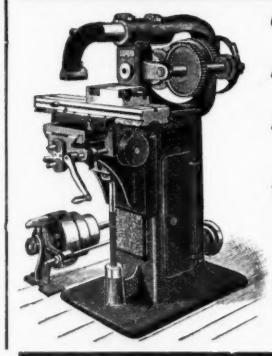

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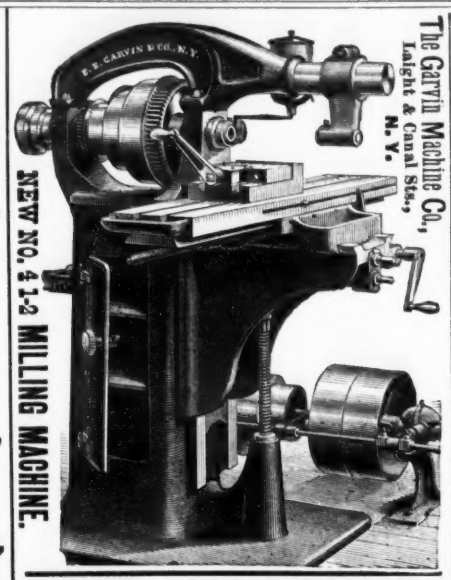

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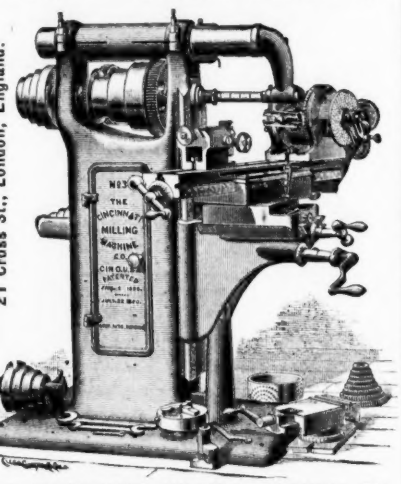

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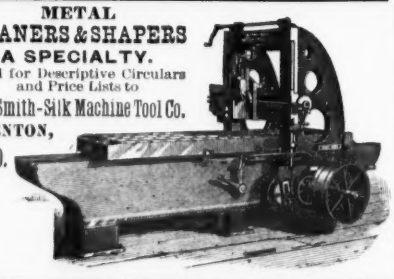

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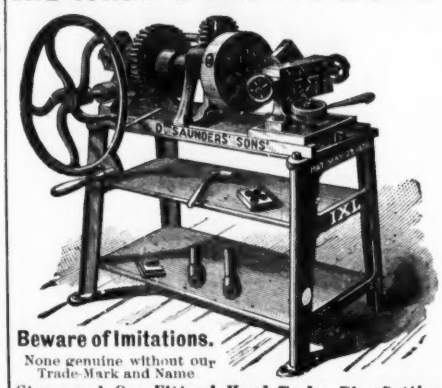

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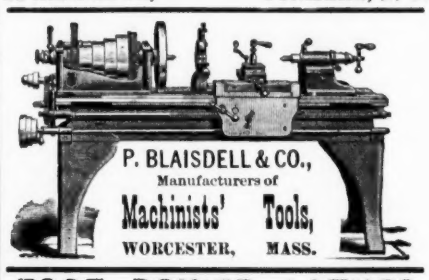

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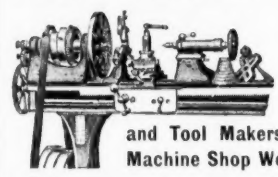

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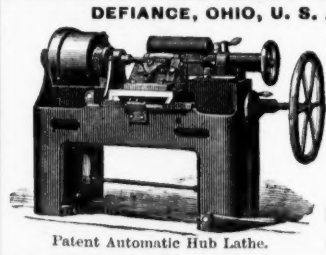

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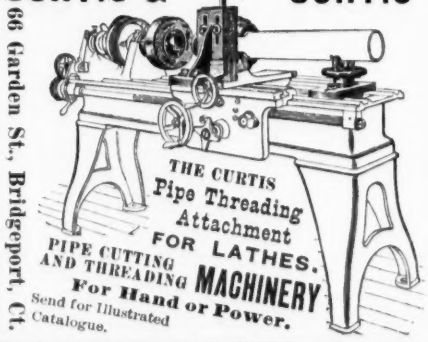

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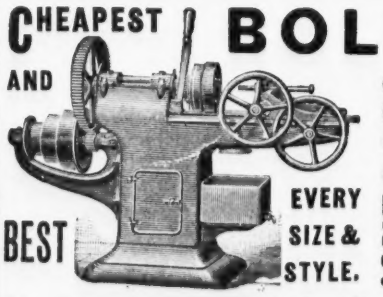

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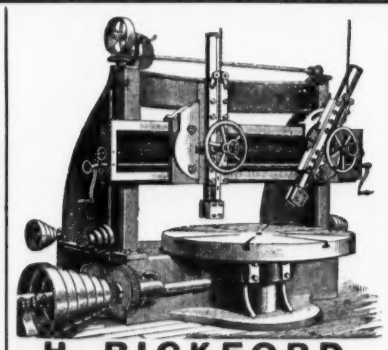

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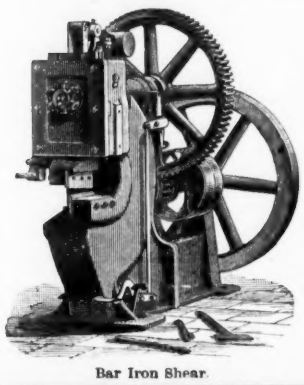
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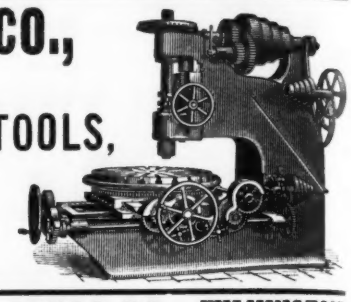

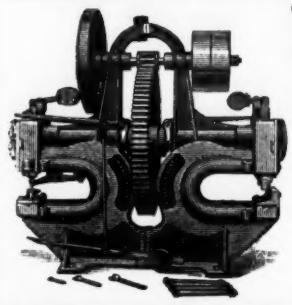
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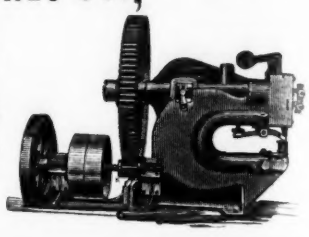

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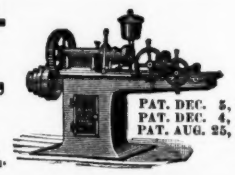
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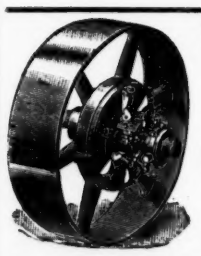
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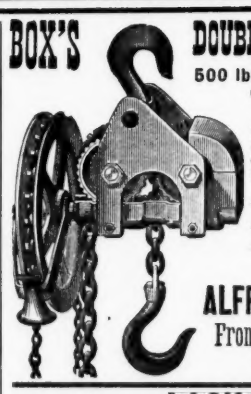
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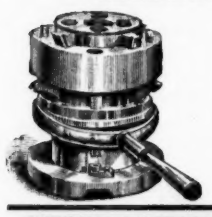
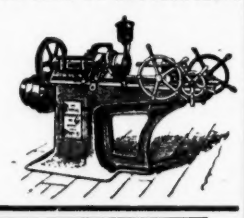

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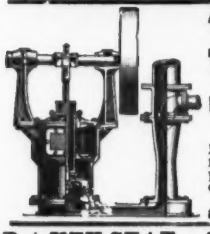
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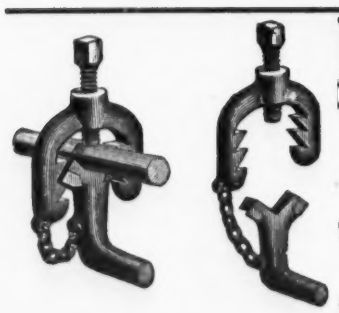
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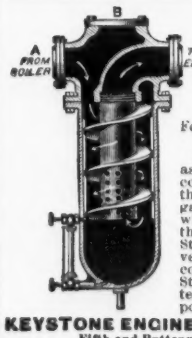

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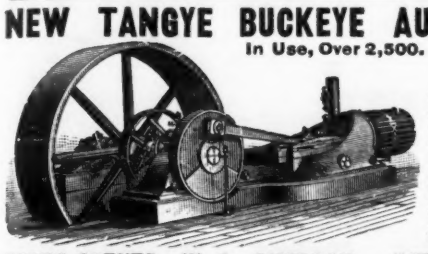

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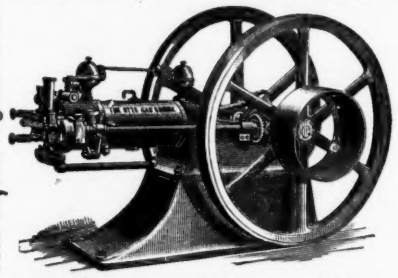

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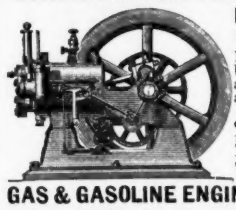

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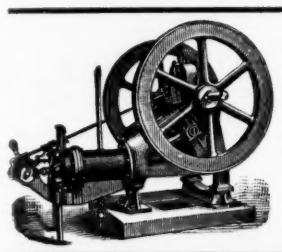

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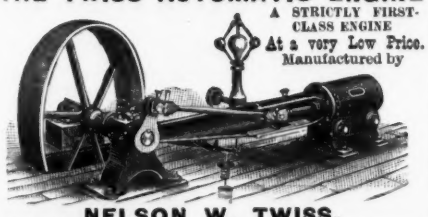

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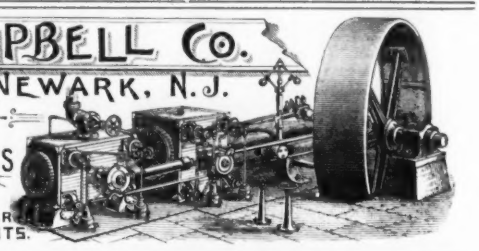

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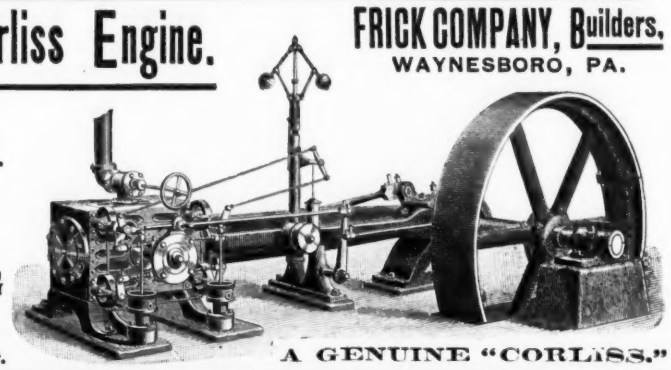

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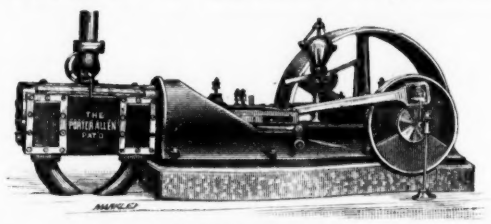

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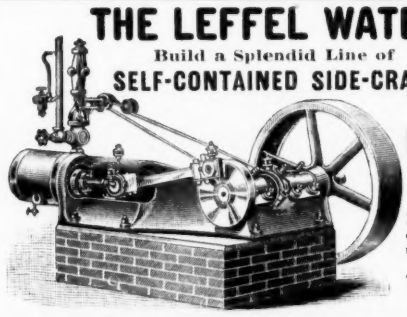

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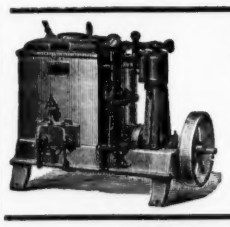

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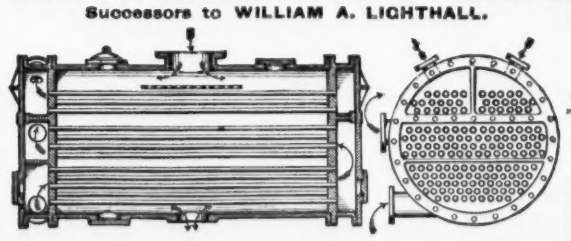

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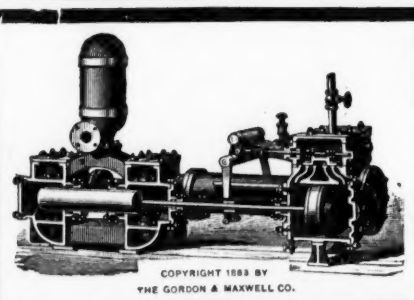

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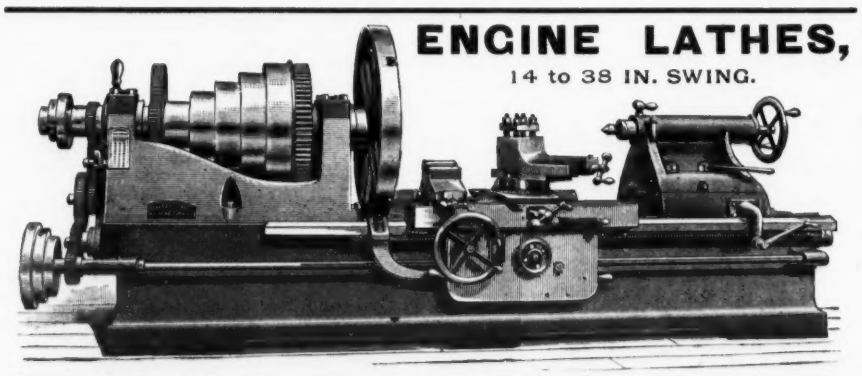

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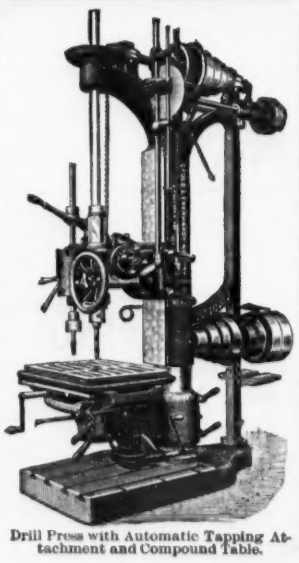

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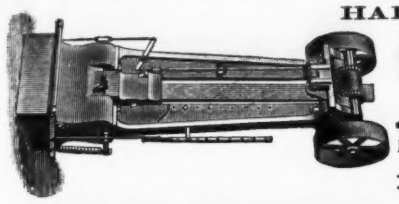

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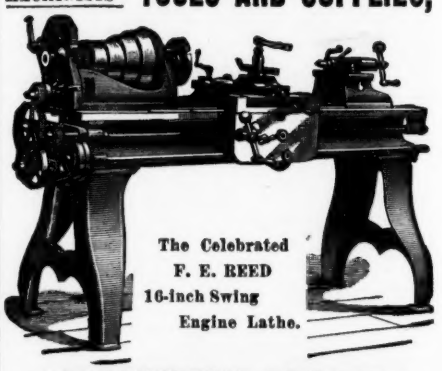

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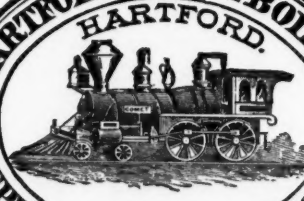

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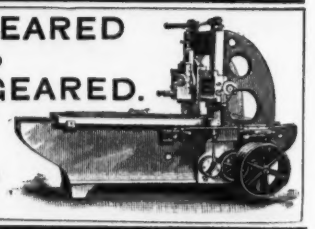

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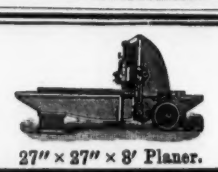

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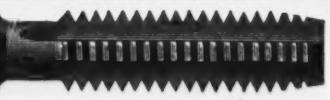

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